



Central Puget Sound Regional Fare Coordination System

Fixed WDOLS Installation Requirements - Phase 2

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Contents

1	Introduction.....	6
1.1	Purpose.....	6
1.2	Scope.....	6
1.3	Acronyms and Abbreviations.....	6
1.4	References.....	7
2	Background.....	8
2.1	Community Transit.....	8
2.1.1	Merrill Creek/Hardeson Road Base.....	9
2.1.2	Kasch Park.....	10
2.2	Everett Transit.....	11
2.3	King County Metro.....	11
2.4	Kitsap Transit.....	12
2.4.1	Main Base.....	12
2.4.2	South Base.....	12
2.4.3	North Base.....	13
2.5	Pierce Transit.....	14
Appendix A	CT Merrill Creek Wireless Site Survey Report.....	16
A.1	Access Points Information.....	16
A.2	Signal Distribution.....	17
A.3	Individual Signal Distribution.....	18
A.4	Maximum Speed Distribution.....	19
A.5	Individual Speed Distribution.....	20
Appendix B	CT Kasch Park Wireless Site Survey Report.....	21
B.1	Access Points Information.....	21
B.2	Signal Distribution.....	22
B.3	Individual Signal Distribution.....	23
B.4	Maximum Speed Distribution.....	24
B.5	Individual Speed Distribution.....	25
Appendix C	KT Main Base Wireless Site Survey Report.....	26
C.1	Access Points Information.....	26
C.2	Signal Distribution.....	27
C.3	Individual Signal Distribution.....	28
C.4	Maximum Speed Distribution.....	29
C.5	Individual Speed Distribution.....	30
Appendix D	KT South Base Wireless Site Survey Report.....	31
D.1	Access Points Information.....	31
D.2	Signal Distribution.....	32
D.3	Maximum Speed Distribution.....	33
Appendix E	KT North Base Wireless Site Survey Report.....	34
E.1	Access Points Information.....	34
E.2	Signal Distribution.....	35
E.3	Maximum Speed Distribution.....	36
Appendix F	PT Main Base Wireless Site Survey Report.....	37
F.1	Access Points Information.....	37

Central Puget Sound Regional Fare Coordination System		Security Level 3	Fixed WDOLS Installation Requirements - Phase 2
F.2	Signal Distribution	38	
F.3	Individual Signal Distribution	39	
F.4	Maximum Speed Distribution.....	40	
F.5	Individual Speed Distribution	41	
F.6	WAP 4 Signal Distribution	42	
F.7	WAP 4 Maximum Speed Distribution.....	43	
F.8	WAP 5 Signal Distribution	44	
F.9	WAP 5 Maximum Speed Distribution.....	45	
Appendix G KCM South Base Wireless Site Survey Report.....		46	
G.1	Access Points Information	46	
G.2	Signal Distribution	47	
G.3	Individual Signal Distribution	48	
G.4	Maximum Speed Distribution.....	49	
G.5	Individual Speed Distribution	50	
Appendix H KCM Central Atlantic Base Wireless Site Survey Report		51	
H.1	Access Points Information	51	
H.2	Signal Distribution	52	
H.3	Individual Signal Distribution	53	
H.4	Maximum Speed Distribution.....	54	
H.5	Individual Speed Distribution	55	
Appendix I KCM Ryerson Base Wireless Site Survey Report		56	
I.1	Access Points Information	56	
I.2	Signal Distribution.....	57	
I.3	Individual Signal Distribution.....	58	
I.4	Maximum Speed Distribution.....	59	
I.5	Individual Speed Distribution	60	
Appendix J KCM East Base Wireless Site Survey Report		61	
J.1	Access Points Information	61	
J.2	Signal Distribution	62	
J.3	Individual Signal Distribution	63	
J.4	Maximum Speed Distribution.....	64	
J.5	Individual Speed Distribution	65	
Appendix K KCM Bellevue Base Wireless Site Survey Report		66	
K.1	Access Points Information	66	
K.2	Signal Distribution	67	
K.3	Individual Signal Distribution	68	
K.4	Maximum Speed Distribution.....	69	
K.5	Individual Speed Distribution	70	
Appendix L KCM North Base Wireless Site Survey Report		71	
L.1	Access Points Information	71	
L.2	Signal Distribution	73	
L.3	Individual Signal Distribution	74	
L.4	Maximum Speed Distribution.....	76	
L.5	Individual Speed Distribution	77	

List of Tables

Table 1: Acronyms and Abbreviations	6
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List of Figures

Figure 1: Location of CT Merrill Creek AP 3 Antenna	10
Figure 2: Location of CT Kasch Park AP 3 Antenna	11
Figure 3: Location of KT South Base AP 1 Antenna	13
Figure 4: Location of KT North Base AP 1 Antenna	14
Figure 5: Location of PT Main Base AP 3 Antenna	15

1 Introduction

This document provides fixed Wireless Data On/Off Loading System (WDOLS) installation requirements for Phase 2 of the Regional Fare Coordination System (RFCS) project. The findings of ERG Transit Systems (USA), Inc. (ERG) are based on site surveys conducted at all bus depot sites by ERG and provided in Appendix A through Appendix F.

1.1 Purpose

The purpose of this document is to explain the number and location of fixed WDOLS Access Points (APs) at each participating bus depot required for Phase 2. The fixed APs are required for communication to the buses in the depot to allow the transfer of usage data (UD) and configuration data (CD).

1.2 Scope

This document will cover installation numbers and locations of fixed WDOLS for the bus depots participating in Phase 2 of the RFCS project.

1.3 Acronyms and Abbreviations

This section contains a list of acronyms and abbreviations used in this document.

Table 1 contains the acronyms and abbreviations that are specific to ERG. Industry-standard acronyms and abbreviations are not defined in this table.

Table 1: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
AP	Access Point
BOC	Back Office Computer
BOM	Bill of Materials
CD	Configuration Data
CT	Community Transit
DAC	Data Acquisition Computer
DDU	Driver Display Unit
ERG	ERG Transit Systems (USA), Inc.
ET	Everett Transit
KT	Kitsap Transit
KCM	King County Metro
OBFTP	On-Board Fare Transaction Processor
PT	Pierce Transit
RFCS	Regional Fare Coordination System

Acronym or Abbreviation	Definition
ST	Sound Transit
UD	Usage Data
WDOLS	Wireless Data On/Off Loading System
WLSE	Wireless LAN Solution Engine

1.4 References

The following materials are to be used in conjunction with or are referenced by this document.

[1] Contract 229944, as amended

2 Background

As part of Phase 2 of the RFCS project, buses will be fitted with equipment to allow passengers to use smart cards as a method of fare payment. The Driver Display Unit (DDU) and On-Board Fare Transaction Processor (OBFTP) will require the transfer of usage data (UD) and configuration data (CD) between them and the Data Acquisition Computer (DAC) by way of wireless transmission. The bus is fitted with the WDOLS, an on-board wireless access point/bridge device, to provide this capability.

To allow the back office equipment, including the Back Office Computer (BOC) and the DAC, to communicate to the buses, one or more APs must be installed at the bus depot. The AP may be mounted on a rooftop location, a wall, or a pole.

The fixed WDOLS equipment comprises two pieces of equipment: the Cisco AP and the Cisco Power Injector. In addition to the AP and Power Injector, an external antenna is required to provide the correct signal coverage of the bus yard. At the time the site surveys were done, these antennas were chosen depending on the location of the AP. The correct antenna choice for each AP at each location is detailed in the following subsections.

ERG states that they are basing their Agency AP quantities and placement, as well as the rate at which buses are expected to enter and exit the depot, according to information provided through site surveys performed by ERG. The design of an operational wireless communications network is far from an exact science, and normally requires data collection after initial installation and operation to assess the actual performance (as opposed to the theoretical performance calculated by site surveys). Manufacturers such as Cisco will not, and can not, provide hard and fast specifications for the performance of their equipment under external wireless network conditions. ERG uses Cisco Wireless LAN Solution Engine (WLSE) equipment, located within the Clearinghouse, to gather information on wireless network performance. This occurs for every agency except for KCM and WSF. ERG will be utilizing the Simple Network Management Protocol (SNMP) Log Server located in a King County Data Center. The SNMP traps will be forwarded from King County's internal systems to the RFCS SNMP Log Server managed by ERG and located in a King County Data Center. This SNMP Log Server will forward traps to the Clearinghouse.

The dynamics of data transmission and potential interference while varying numbers of buses (and potentially other equipment) are present in the yard will be factors in the analysis of this captured data, as well as the timing as to when bus equipment is requesting network connectivity through the APs. The communications speeds indicated in the site survey results are indicative only, and may not reflect actual transmission speeds attained. The collection of data during Phase 2 system operation may cause ERG to re-evaluate the wireless design if any significant issues are detected, and AP configuration, quantities, and/or physical location may need modification accordingly.

2.1 Community Transit

As part of Phase 2 of the RFCS project, Community Transit (CT) is installing equipment on buses at two locations: Merrill Creek and Kasch Park. Merrill Creek will have a total of approximately 178 buses and Kasch Park will have a total of approximately 127 buses.

Each of these locations was surveyed, and the required numbers of APs were determined.

2.1.1 Merrill Creek/Hardeson Road Base

The site survey was conducted and, based on the measured results, at least three APs will be required at this base to provide signal coverage and download speed to all buses.

Two APs were installed for the Beta trial. There will be no change of location or antenna type for these.

CT requested that ERG perform a site survey to ensure wireless coverage for a new area at the southwestern corner of the Merrill Creek depot. ERG surveyed the area and found that coverage would be assured by the addition of a third AP to the location.

Section A.2 of Appendix A, CT Merrill Creek Wireless Site Survey Report, shows the combined measured signal strengths.

2.1.1.1 AP 1 – No Change from Beta

AP 1 shall remain in the same location and the existing antenna shall remain on the roof of the maintenance building at the north end of the bus depot.

2.1.1.2 AP 2 – No Change from Beta

AP 2 shall remain in the same location and the existing antenna shall remain on the roof of the administration building at the southern end of the bus depot.

2.1.1.3 AP 3 – New Installation

AP 3 shall be installed on the northwestern corner of the administration building. Figure 1 shows the proposed location of the antenna on the roof of the building.

A 90-degree directional antenna shall be used to provide complete coverage of the parking lot.



Figure 1: Location of CT Merrill Creek AP 3 Antenna

2.1.2 Kasch Park

The site survey was conducted and, based on the measured results, at least three APs will be required at this base to provide signal coverage and download speed to all buses.

Two APs were installed for the Beta trial. There will be no change of location for either of these APs. However, both of the antennas should be changed for another type.

To ensure reliable wireless connection to the number of buses at Kasch Park (approximately 127), a third AP will be required to be installed in the same location as the existing AP on the maintenance building.

Section B.2 of Appendix B, CT Kasch Park Wireless Site Survey Report, shows the combined measured signal strengths.

2.1.2.1 AP 1 – Antenna Change for Phase 2

AP 1 shall remain in the same location above the bus pressure wash area. The antenna location will remain the same, but a different antenna should be installed to provide coverage of the area required. The omni-directional antenna should be replaced by a 180-degree directional antenna to provide best coverage of the area.

2.1.2.2 AP 2 – Antenna Change for Phase 2

AP 2 shall remain in the same location above the offices in the maintenance building. The antenna location will remain the same, but a different antenna should be installed to provide coverage of the area required. The 180-degree antenna should be replaced by a 90-degree directional antenna to provide best coverage of the area.

2.1.2.3 AP 3 – New Installation

AP 3 shall be installed in the same location as AP 2. The antenna shall be installed on the same mount as the antenna for AP 2.

A 90-degree antenna should be installed facing southwest to provide the required coverage.

Figure 2 shows the location of the AP 3 antenna.

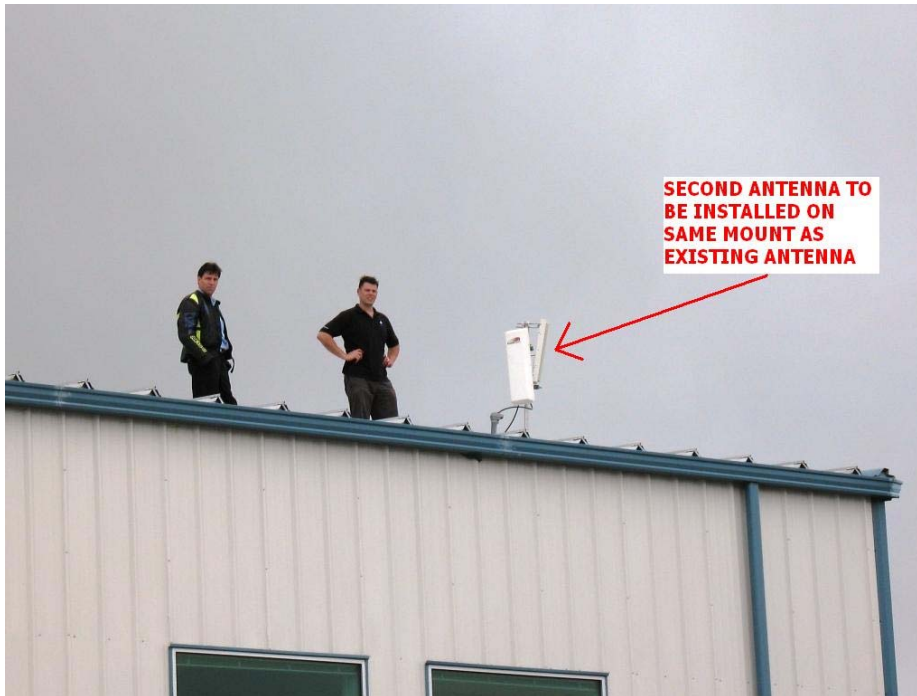


Figure 2: Location of CT Kasch Park AP 3 Antenna

2.2 Everett Transit

Everett Transit (ET) shall be installing equipment on a total of approximately 50 buses as part of Phase 2 of the RFCS. ERG has conducted a site survey of the Cedar St. depot, but understands that ET may be changing the location of some buses in the near future to a new bus depot. If buses will be taken from the existing locations and parked at a new location, ERG will have to conduct another site survey of the new base. For this reason, ERG will wait for confirmation from ET before providing recommendations for coverage to the Cedar St. depot, as coverage requirements may change considerably.

2.3 King County Metro

King County Metro (KCM) is installing equipment on a total of approximately 1300 buses as part of Phase 2 of the RFCS project.

ERG has conducted site surveys on the sites of the APs that were found to be active. Both signal strength measurements and also speed measurements were taken.

Note: ERG performed site surveys on the KCM bases with an active association to the AP. Because the survey was performed on a live system with other associations (buses), the Maximum Speed Distribution is not necessarily an active indication of the maximum speed possible for a particular AP.

Measurements taken are for indicative purposes only and are not be solely relied upon for planning and implementation purposes.

2.4 Kitsap Transit

As part of Phase 2 of the RFCS project, Kitsap Transit (KT) is installing equipment on buses at three locations: the Main Base, North Base, and South Base. KT is installing equipment on approximately 105 buses in total.

2.4.1 Main Base

The site survey was conducted and, based on the measured results, two APs will be required at this base to provide required signal coverage and download speed.

2.4.1.1 AP 1 – Antenna Change for Phase 2

AP 1 shall remain in the same location above the offices in the building. The antenna location will remain the same, but a different antenna should be installed to provide coverage of the area required. The omni-directional antenna should be replaced by a 120-degree directional antenna to provide best coverage of the area required.

2.4.1.2 AP 2 – New Installation

During Beta, ERG and KT identified some areas toward the north end of the Main Base that did not have adequate coverage of wireless signal. Both ERG and KT experienced some difficulty holding a connection to some buses parked at the end of the parking lot at this location.

For this reason, another AP must be installed in the same location as the existing AP. A 60-degree directional antenna should be used to direct coverage to the far end of the yard (north).

Section C.2 of Appendix C, KT Main Base Wireless Site Survey Report, shows the combined measured signal strengths.

2.4.2 South Base

The site survey was conducted and, based on the measured results, one AP will be required at this base to provide required signal coverage and download speed.

2.4.2.1 AP 1 – New Installation

AP 1 shall be installed on the northwest corner of the roof of the only building at the location (Figure 3).

A 180-degree antenna should be used to provide adequate coverage of the yard.

Section D.2 of Appendix D, KT South Base Wireless Site Survey Report, shows the combined measured signal strengths.



Figure 3: Location of KT South Base AP 1 Antenna

2.4.3 North Base

The site survey was conducted and, based on the measured results, one AP will be required at this base to provide the required signal coverage and download speed.

2.4.3.1 AP 1 – New Installation

AP 1 shall be installed on the northwest corner of the roof of the only building at the location (Figure 4).

A 90-degree antenna should be used to provide adequate coverage of the yard.

Section E.2 of Appendix E, KT North Base Wireless Site Survey Report, shows the combined measured signal strengths.



Figure 4: Location of KT North Base AP 1 Antenna

2.5 Pierce Transit

As part of the RFCS Phase 2 Installation, Pierce Transit (PT) is installing equipment on buses at one location, the Main Base. PT has a total of 209 buses.

2.5.1.1 Main Base

The site survey was conducted and, based on the measured results, at least three APs will be required at this base to provide signal coverage and download speed to all buses.

Two APs were installed for the Beta trial. There will be no change of location for these devices. The antenna on the bus wash (building 2) should be changed.

Section F.2 of Appendix F, PT Main Base Wireless Site Survey Report, shows the combined measured signal strengths.

2.5.1.2 AP 1 – Antenna Change for Phase 2

AP 1 shall remain in the same location above the bus wash area. The antenna location will remain the same, but a different antenna should be installed to provide coverage of

the area required. The 120-degree antenna should be replaced by a 180-degree directional antenna to provide best coverage of the area.

2.5.1.3 AP 2 – No Change from Beta

AP 2 shall remain in the same location and the existing antenna shall remain on the roof of the administration building (building 4).

2.5.1.4 AP 3 – New Installation

AP 3 shall be installed on the southeastern corner of the maintenance building (building 1). Figure 5 shows the proposed location of the antenna on the roof of the building.

A 90-degree directional antenna shall be used to provide complete coverage of the area required.



Figure 5: Location of PT Main Base AP 3 Antenna

Appendix A CT Merrill Creek Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: CT Merrill Creek

Survey Description: Survey includes existing APs installed, plus a new AP required to cover the southwest corner of the bus depot.

Time of Survey: 6/13/2007 2:16:33 P.M.

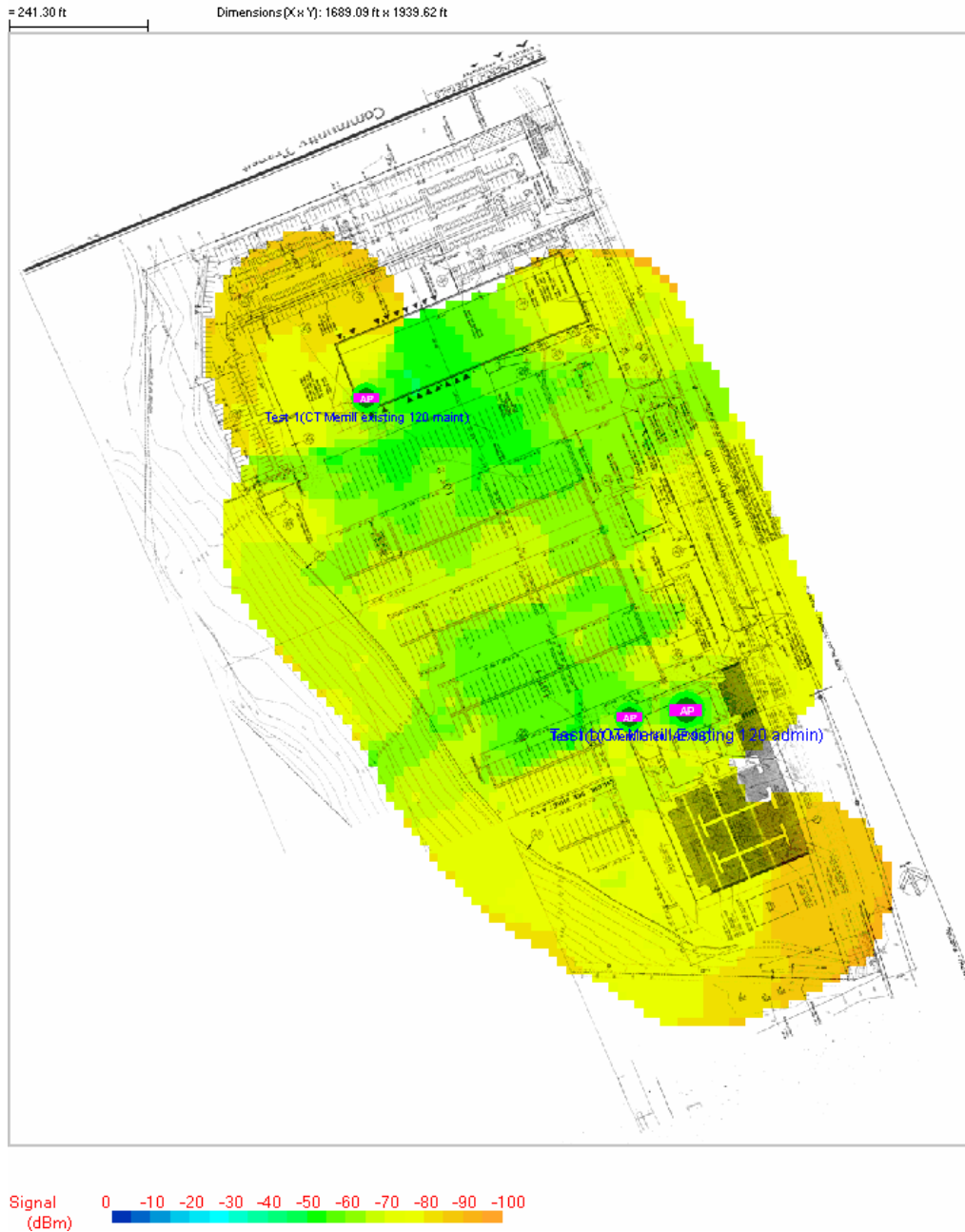
A.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1 (CT Merrill Existing 120 admin)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-54
Test 1 (CT Merrill existing 120 maint)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-51
Test 1 (CT Merrill new AP 90)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-67

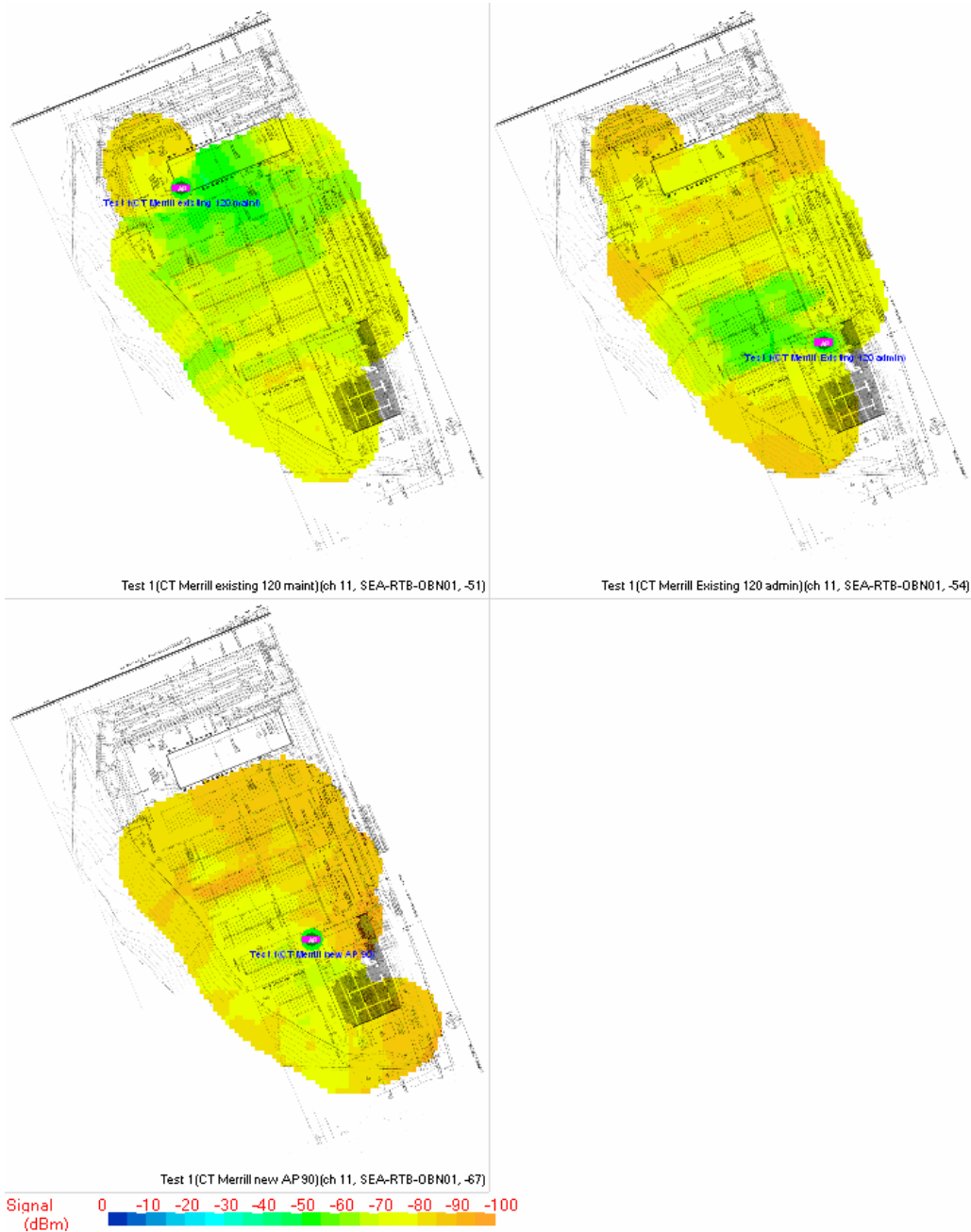
of AP 3

Total AP: 3

A.2 Signal Distribution



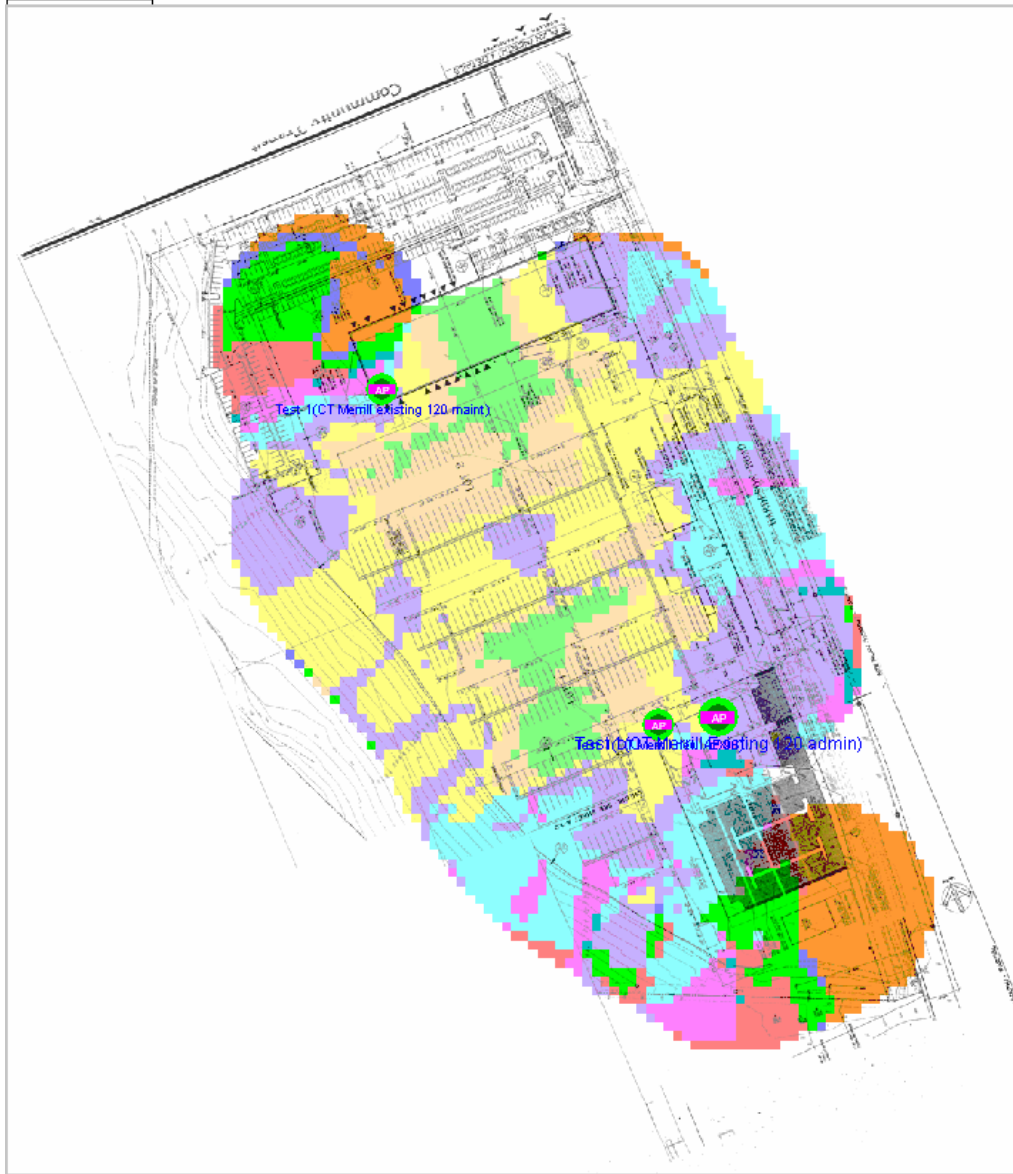
A.3 Individual Signal Distribution



A.4 Maximum Speed Distribution

= 241.30 ft

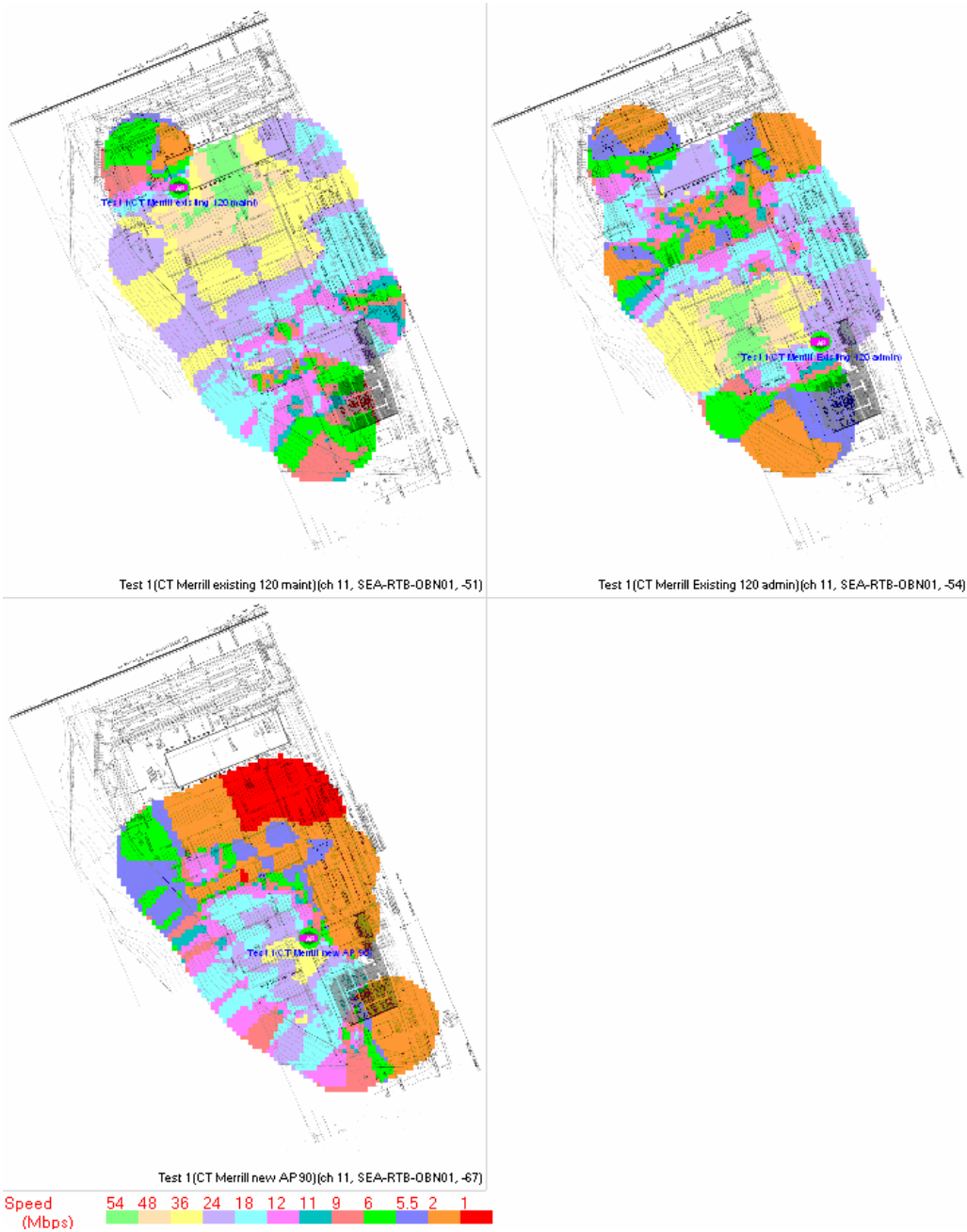
Dimensions[X x Y]: 1689.09 ft x 1939.62 ft



Speed
(Mbps)

54	48	36	24	18	12	11	9	6	5.5	2	1
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A.5 Individual Speed Distribution



Appendix B CT Kasch Park Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: CT Kasch Park

Survey Description: Base surveyed comprehensively to cover all areas of the yard, particularly the southwest corner at the farthest point.

Time of Survey: 7/13/2007 9:50:45 A.M.

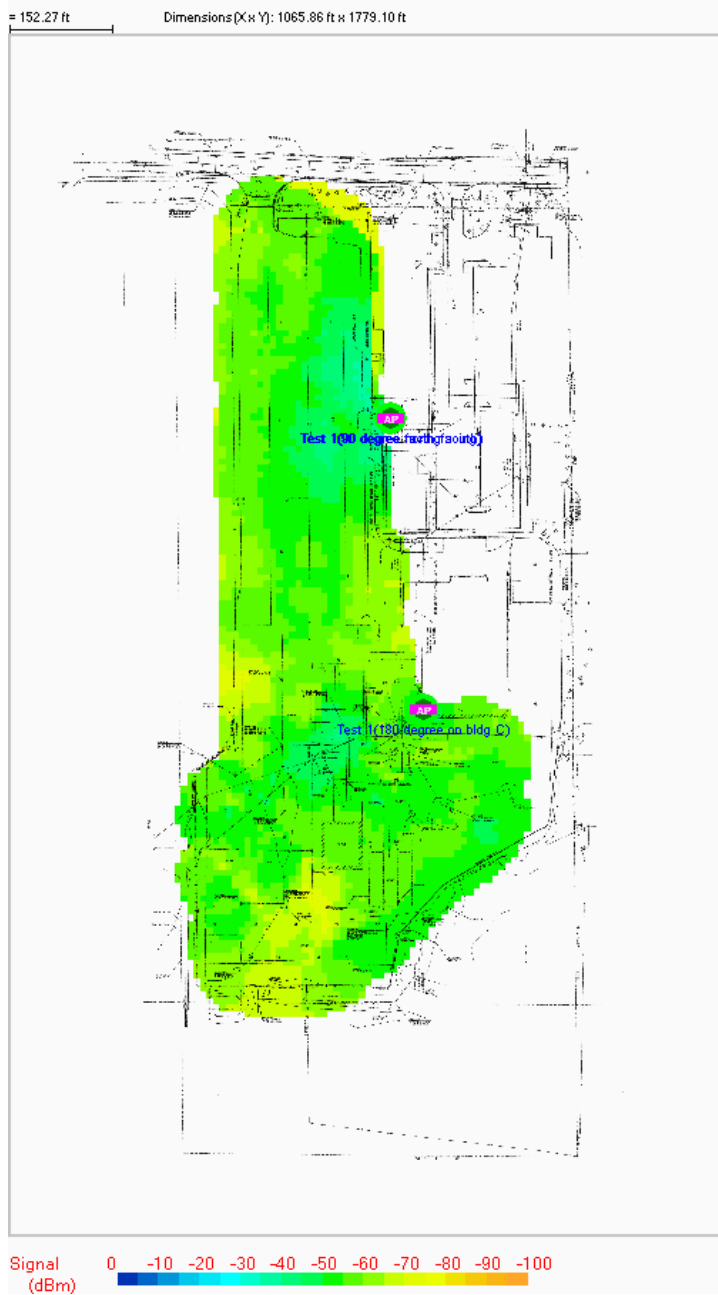
B.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1 (180 degree on bldg C)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-43
Test 1 (90 degree facing south)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-44
Test 1 (90 degree north facing)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-41

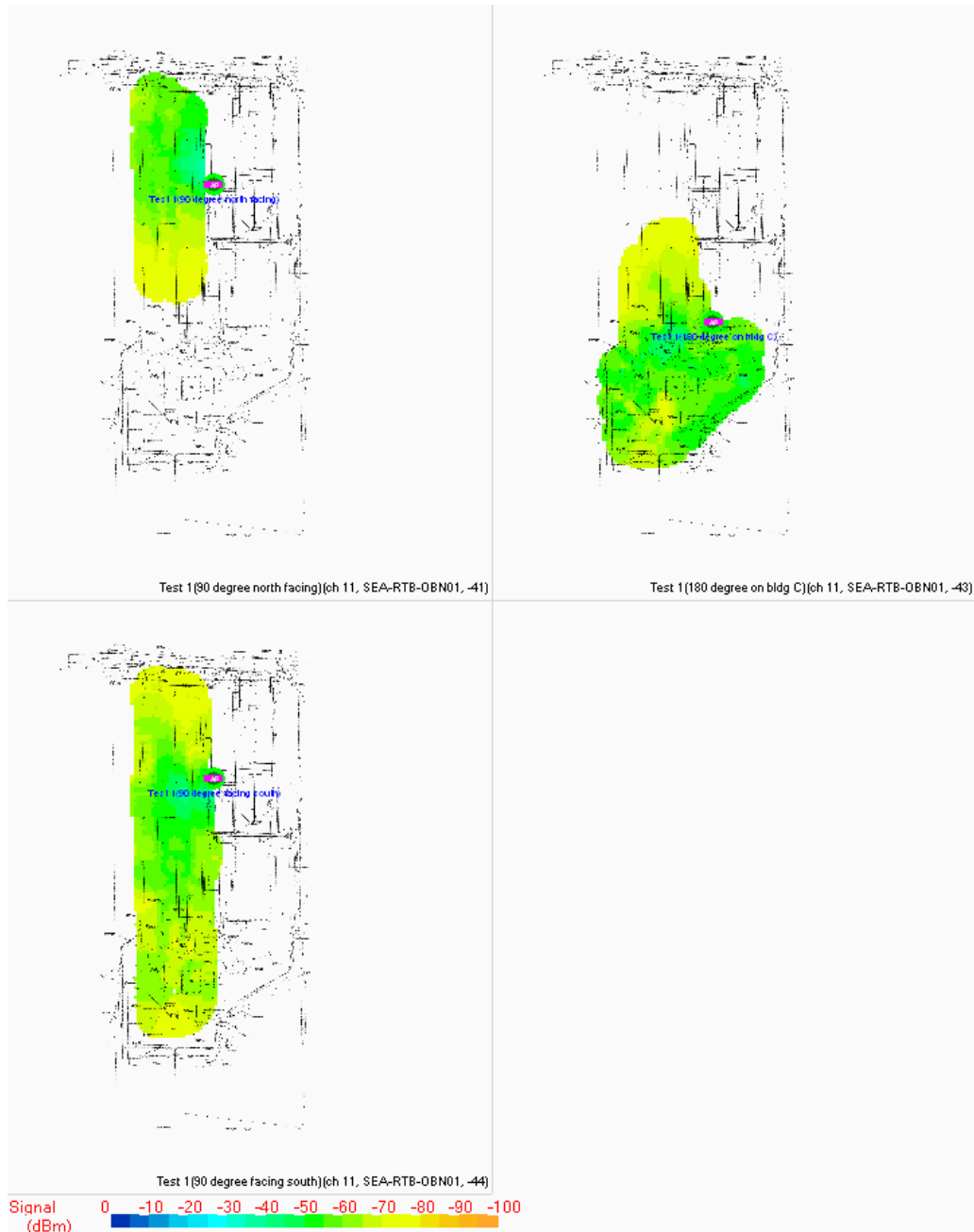
of AP 3

Total AP: 3

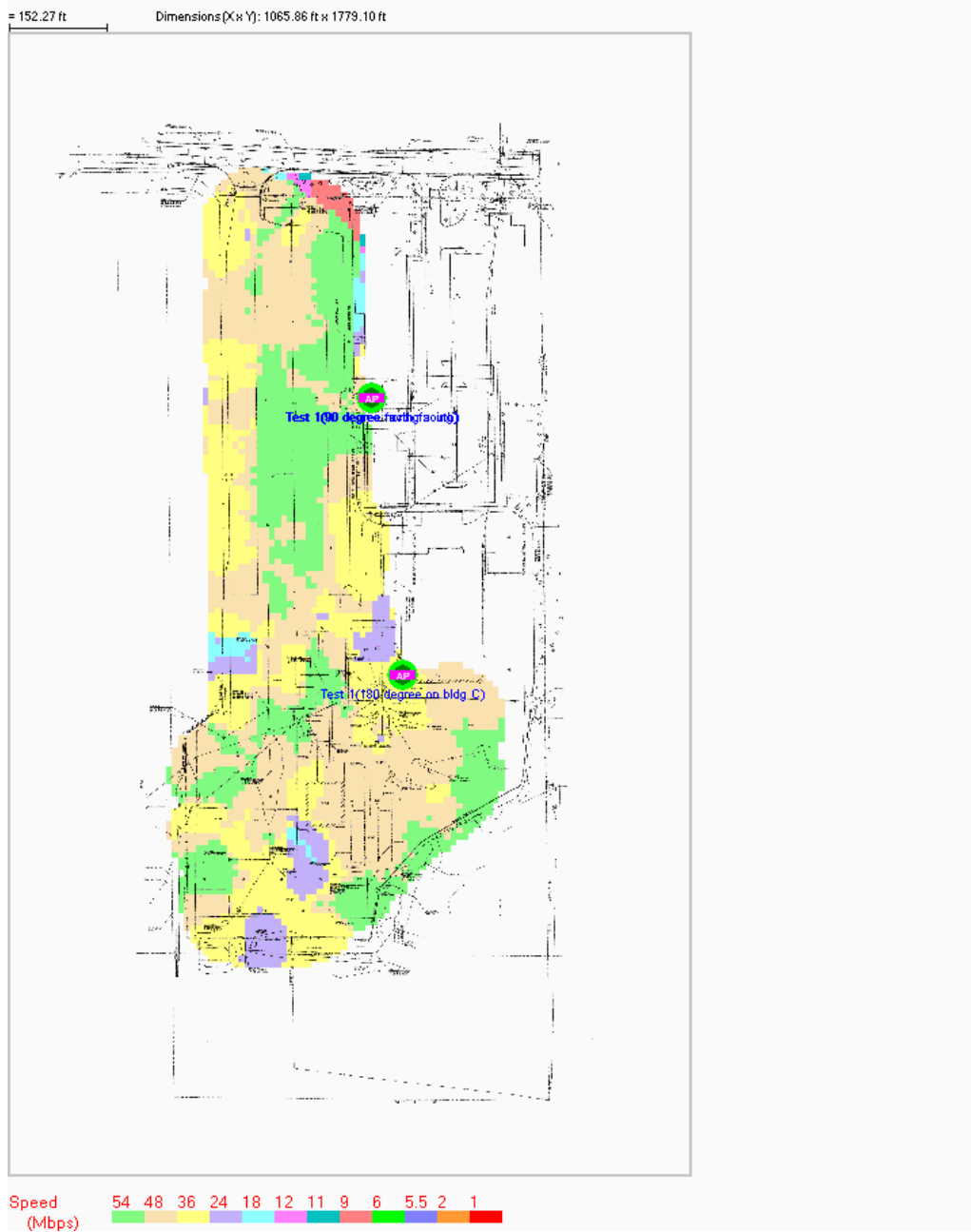
B.2 Signal Distribution



B.3 Individual Signal Distribution



B.4 Maximum Speed Distribution



B.5 Individual Speed Distribution



Appendix C KT Main Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KT Main Base

Survey Description: Survey to ensure that the north end of the yard (farthest point) has adequate coverage using directional antenna.

Time of Survey: 6/19/2007 11:36:56 A.M.

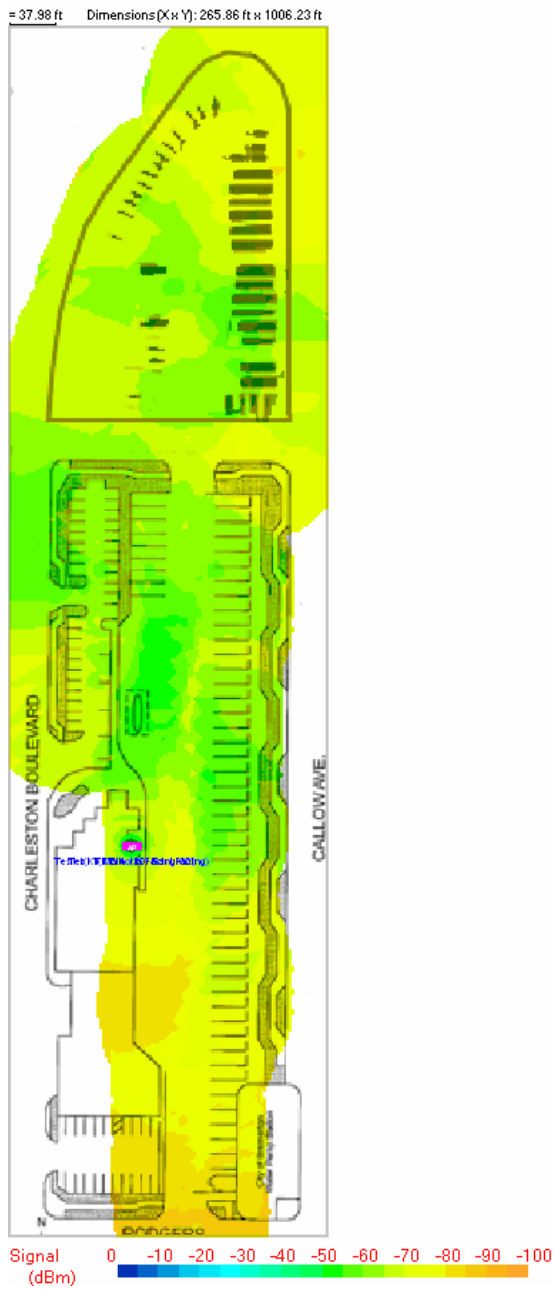
C.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1 (KT Main 120' East Facing)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-54
Test 1 (KT North Facing 60')	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-52

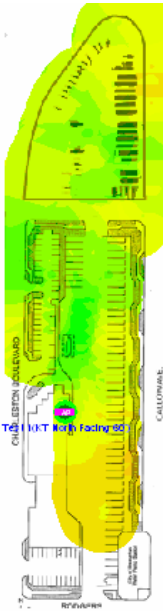
of AP 2

Total AP: 2

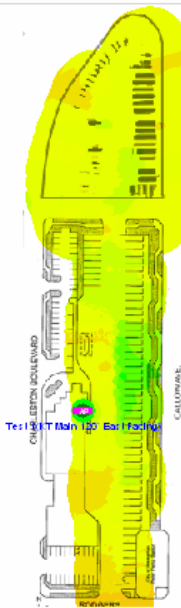
C.2 Signal Distribution



C.3 Individual Signal Distribution



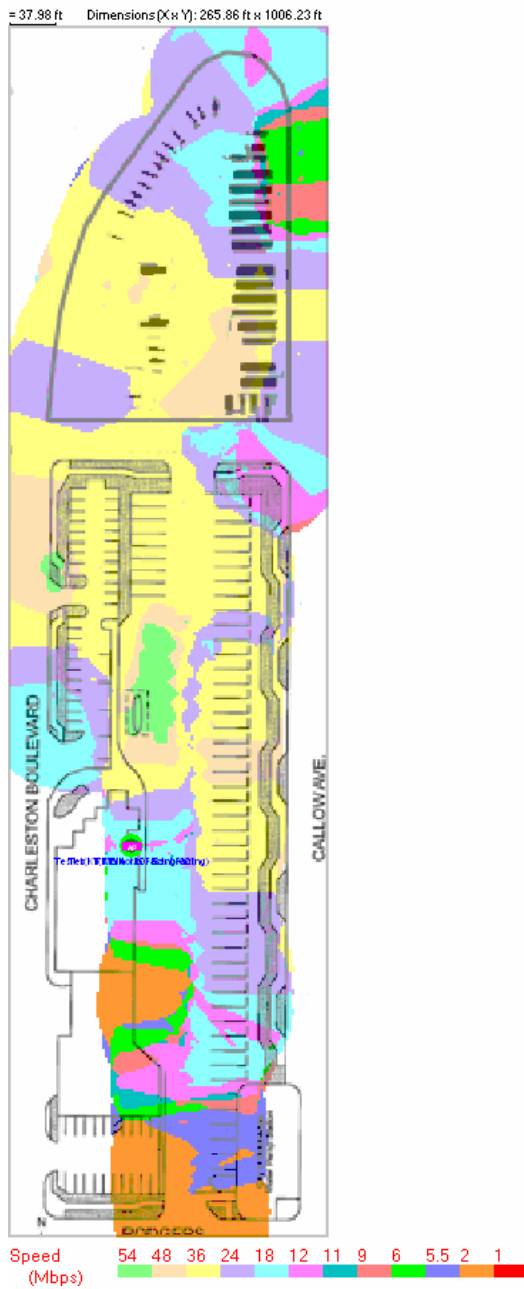
Test 1 (KT North Facing 60°)(ch 11, SEA-RTB-0BN01, -52)



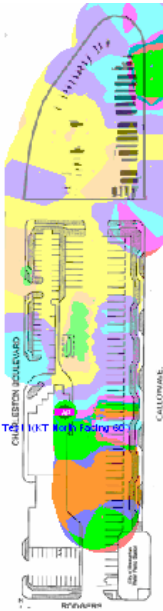
Test 1 (KT Main 120° East Facing)(ch 11, SEA-RTB-0BN01, -54)

Signal
(dBm) 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100

C.4 Maximum Speed Distribution



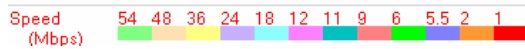
C.5 Individual Speed Distribution



Test 1(KT North Facing 60°)(ch 11, SEA-RTB-0BN01, -52)



Test 1(KT Main 120° East Facing)(ch 11, SEA-RTB-0BN01, -54)



Appendix D KT South Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KT South Base

Survey Description: Determine the channel of the existing wireless link to KT Bremerton.

Time of Survey: 6/19/2007 1:59:08 P.M.

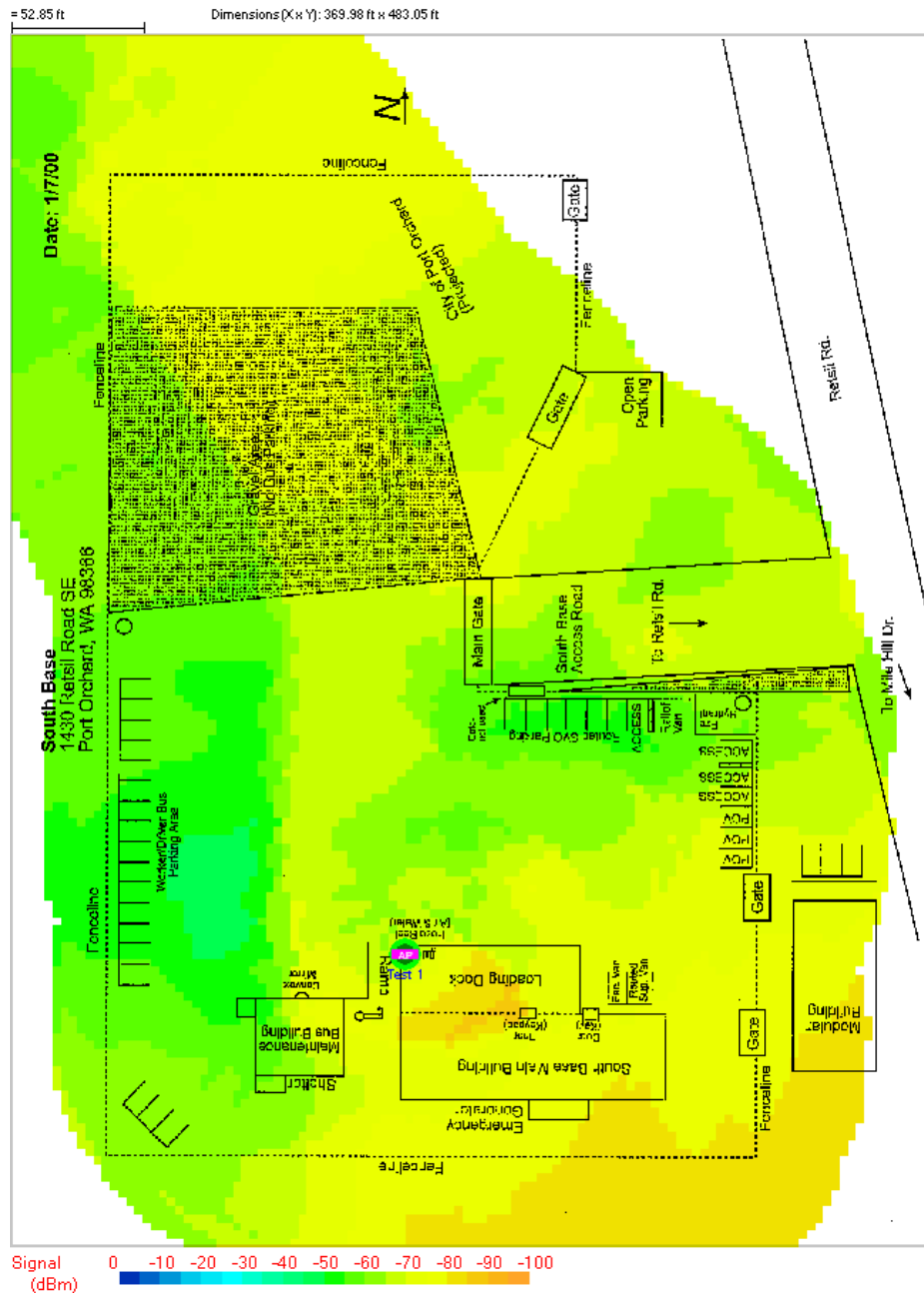
D.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-48

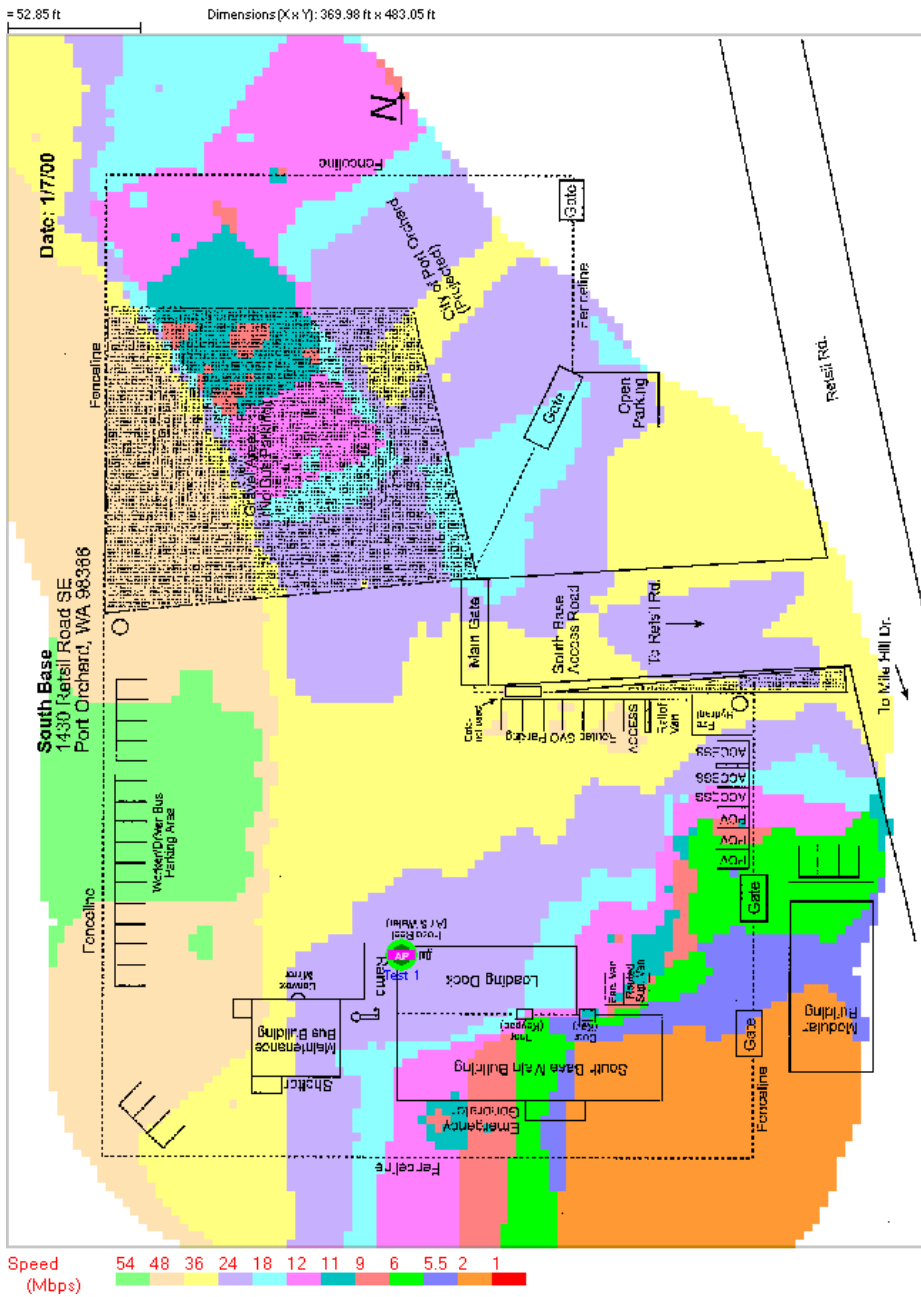
of AP 1

Total AP: 1

D.2 Signal Distribution



D.3 Maximum Speed Distribution



Appendix E KT North Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KT North Base

Survey Description: Consider building construction when choosing an antenna location.

Time of Survey: 6/20/2007 10:37:12 A.M.

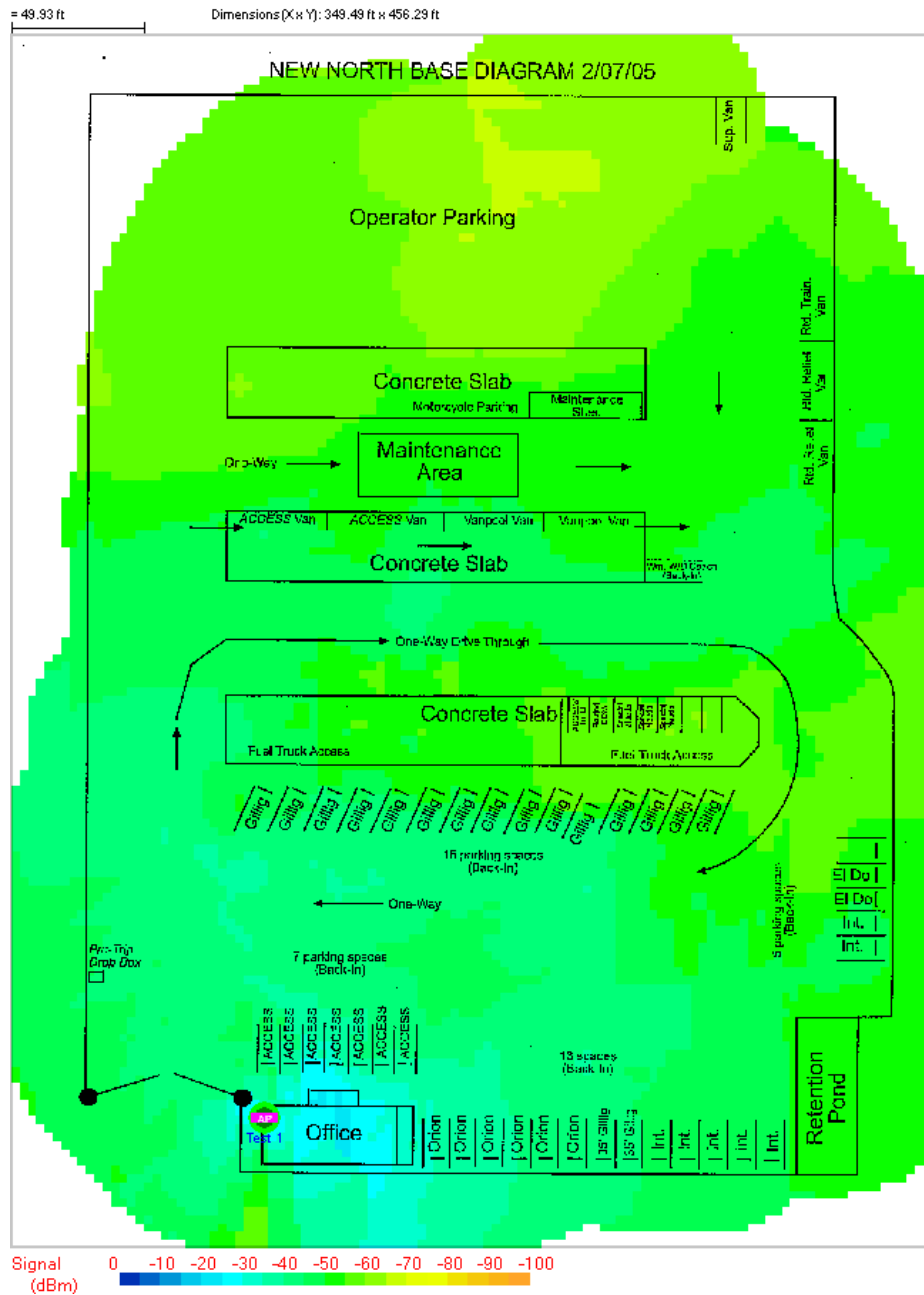
E.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-17

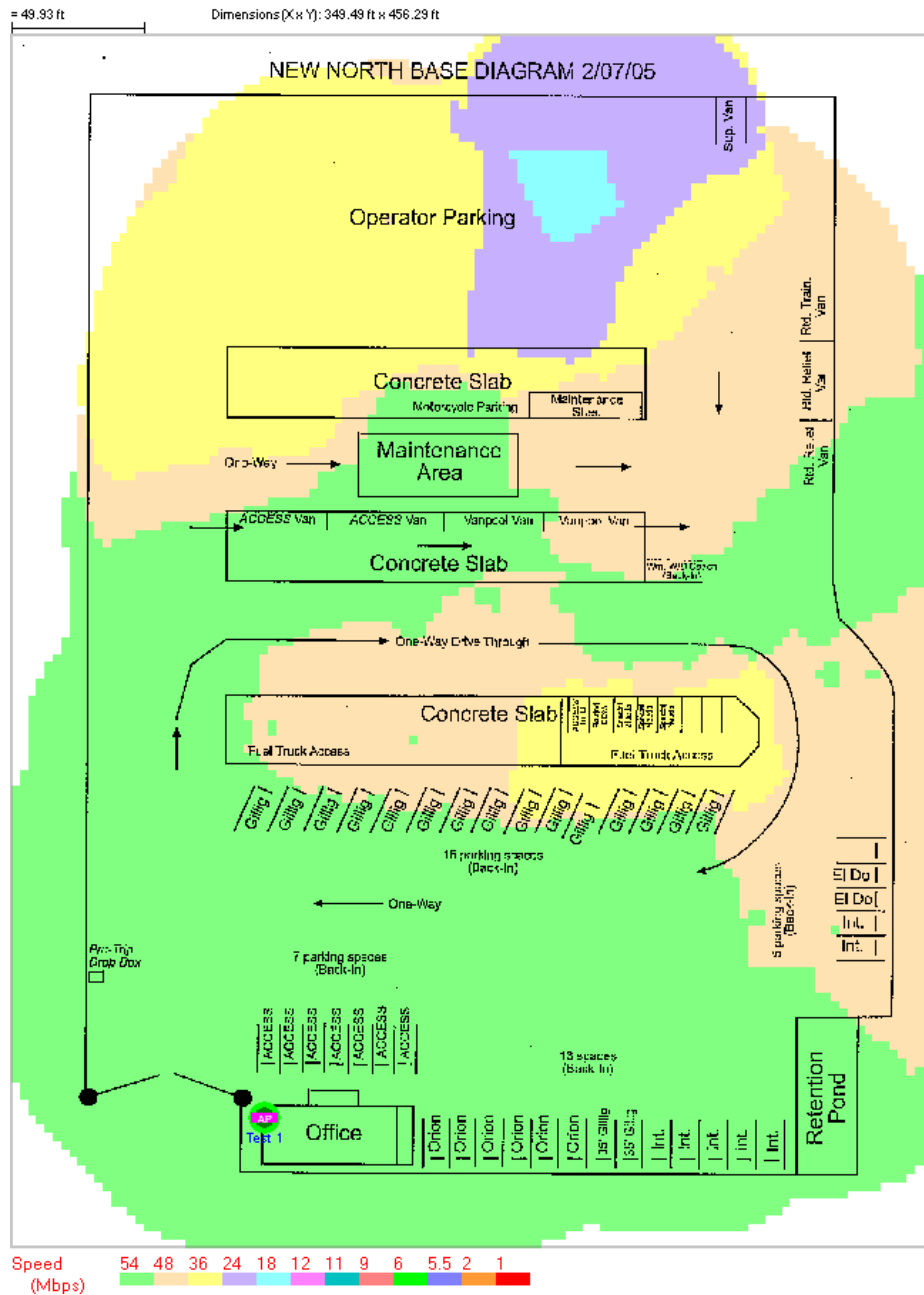
of AP 1

Total AP: 1

E.2 Signal Distribution



E.3 Maximum Speed Distribution



Appendix F PT Main Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: PT Main Base

Survey Description: Consider an additional AP on the Maintenance Building.

Time of Survey: 6/6/2007 2:56:15 P.M.

F.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Test 1 (120 degree on admin bldg realigned)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-48
Test 1 (180 degree on bus wash)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-52
Test 1 (90 degree on maint bldg cnr)	802.11g	00:15:C7:80:E7:A0	11	SEA-RTB-OBN01	100	-47

of AP 3

Total AP: 3

Surveyor: Matt Hulbert

Location: PT Main Base

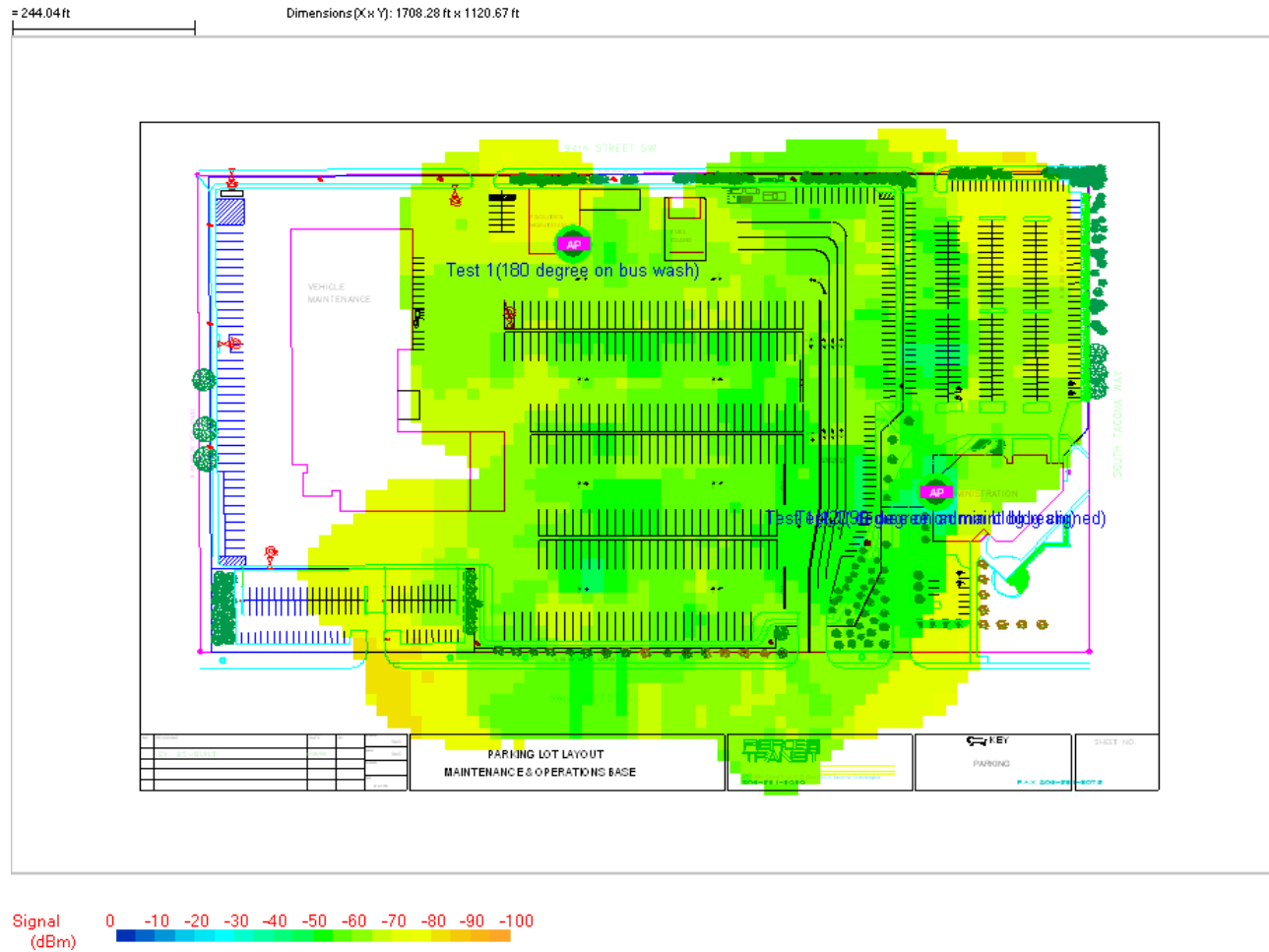
Survey Description: Addition of Access Points to cover lower lot and building 5 parking lot

Time of Survey: 10/17/2011

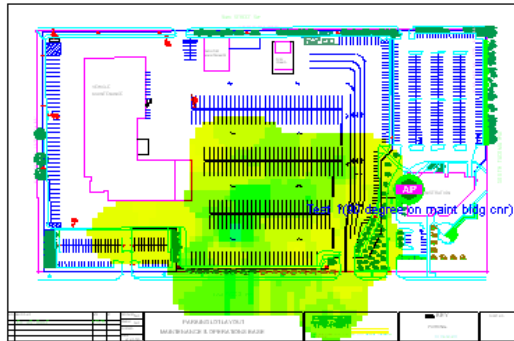
Comment [jb1]: CR-002624 PT Install-Comm Base WDOLS

<u>AP Name</u>	<u>Media Type</u>	<u>Mac Address</u>	<u>Channel</u>	<u>SSID</u>	<u>Power (mW)</u>	<u>Max Signal</u>
<u>WAP 4 (180 degree lower lot)</u>	<u>802.11g</u>	<u>00:15:C7:80:E7:A0</u>	<u>7</u>	<u>SEA-RTB-OBN01</u>	<u>100</u>	<u>-42</u>
<u>WAP 5 (180 degree building 5 parking lot)</u>	<u>802.11g</u>	<u>00:15:C7:80:E7:A0</u>	<u>5</u>	<u>SEA-RTB-OBN01</u>	<u>100</u>	<u>-46</u>

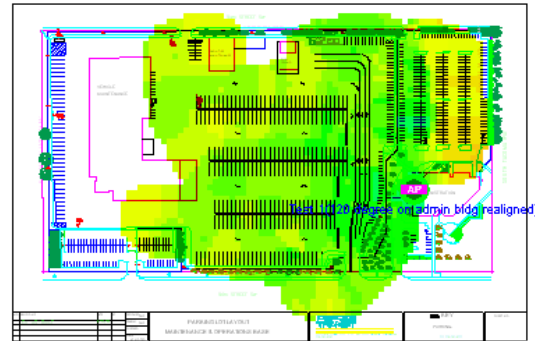
F.2 Signal Distribution



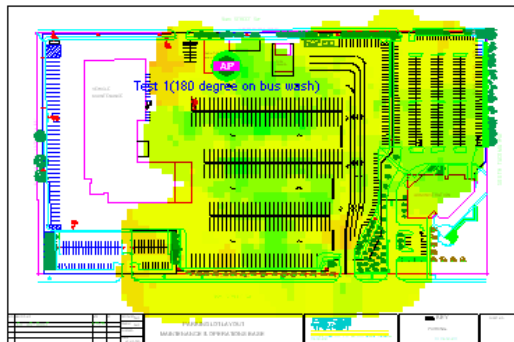
F.3 Individual Signal Distribution



Test 1 (90 degree on maint bldg cnr)(ch 11, SEA-RTB-OBNO1, -47)



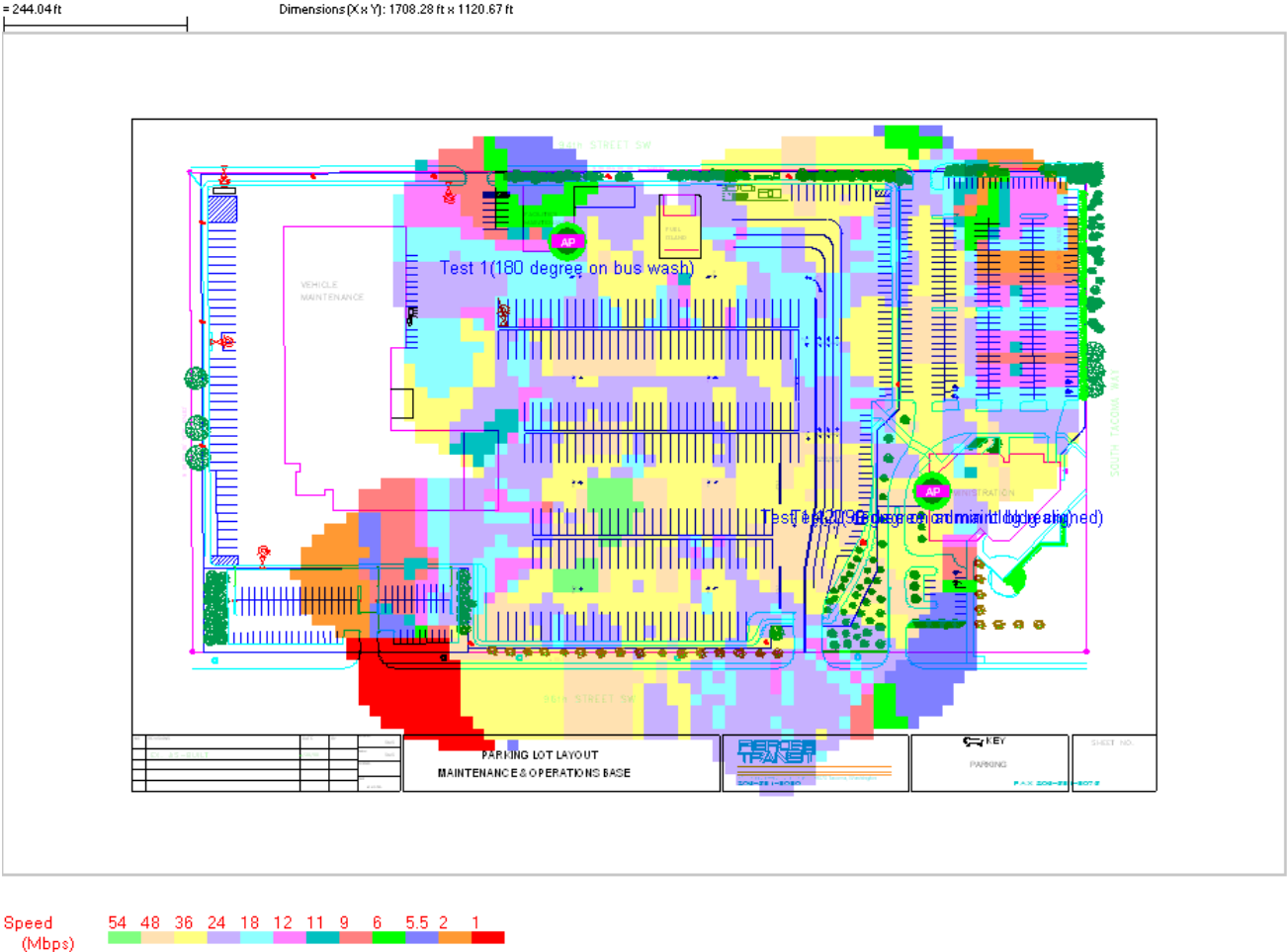
Test 1 (120 degree on admin bldg realigned)(ch 11, SEA-RTB-OBNO1, -48)



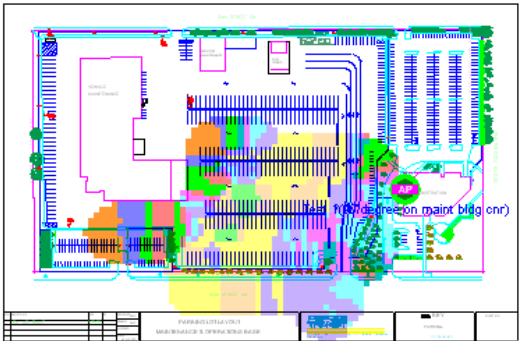
Test 1 (180 degree on bus wash)(ch 11, SEA-RTB-OBNO1, -52)

Signal (dBm) 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100

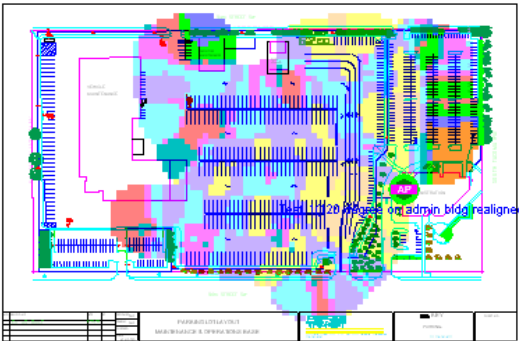
F.4 Maximum Speed Distribution



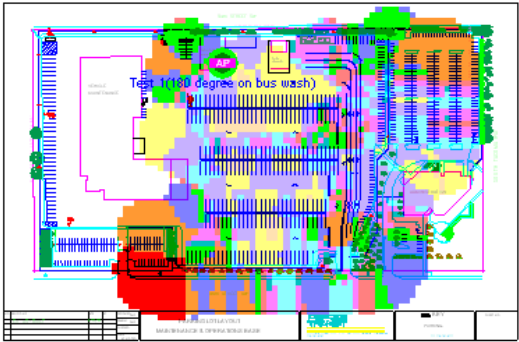
F.5 Individual Speed Distribution



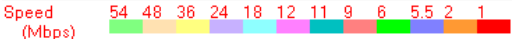
Test 1 (90 degree on maint bldg cnr)(ch 11, SEA-RTB-OBNO1, -47)



Test 1 (120 degree on admin bldg realigned)(ch 11, SEA-RTB-OBNO1, -48)



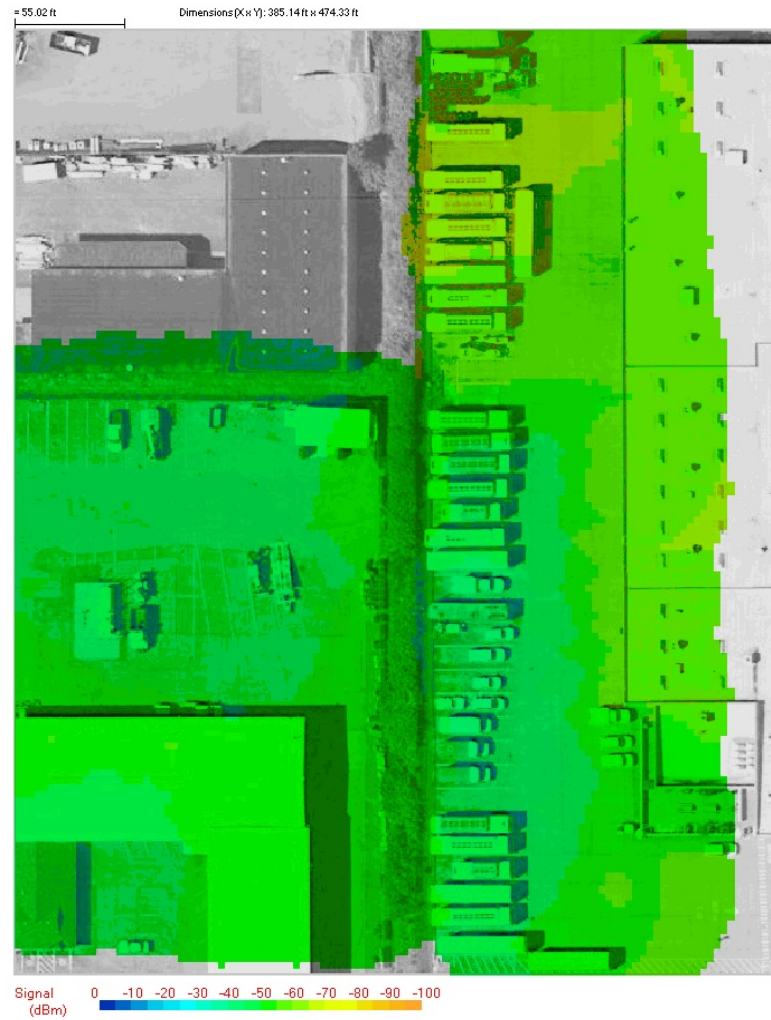
Test 1 (180 degree on bus wash)(ch 11, SEA-RTB-OBNO1, -52)



F.6

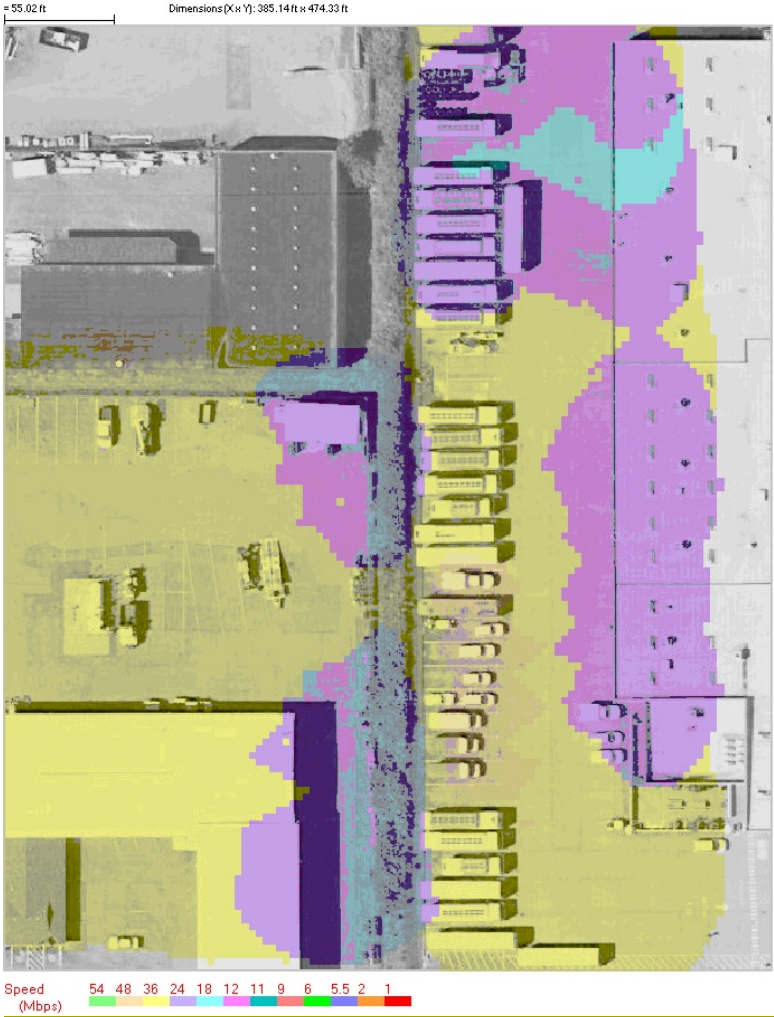
WAP 4 Signal Distribution

Comment [jb2]: CR-002624 PT
Install-Comm Base WDOLS



Comment [jb3]: CR-002624 PT
Install-Comm Base WDOLS

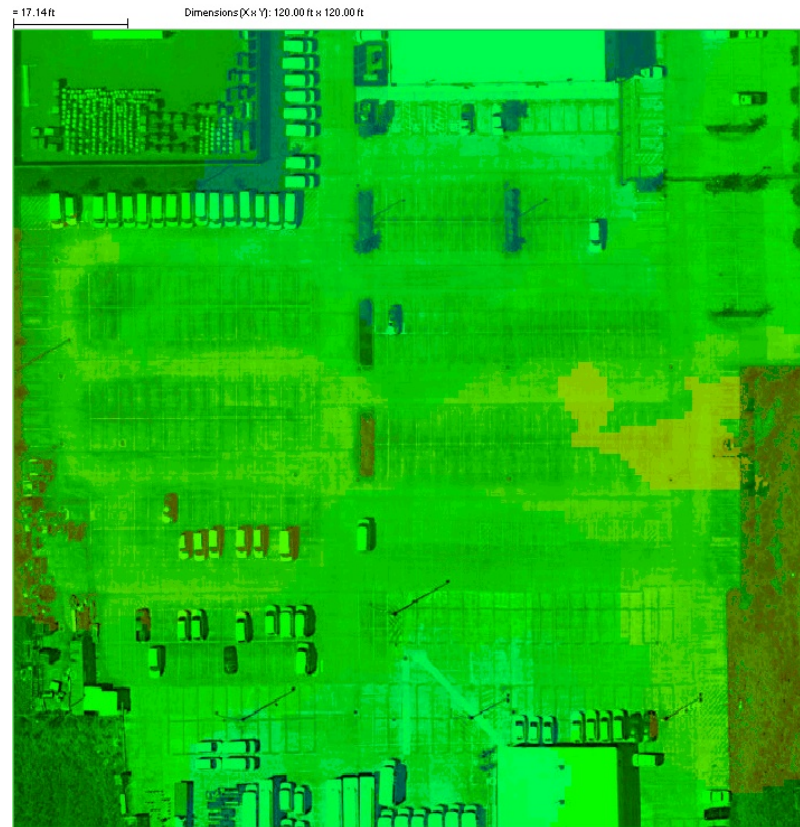
F.7 WAP 4 Maximum Speed Distribution



F.8

WAP 5 Signal Distribution

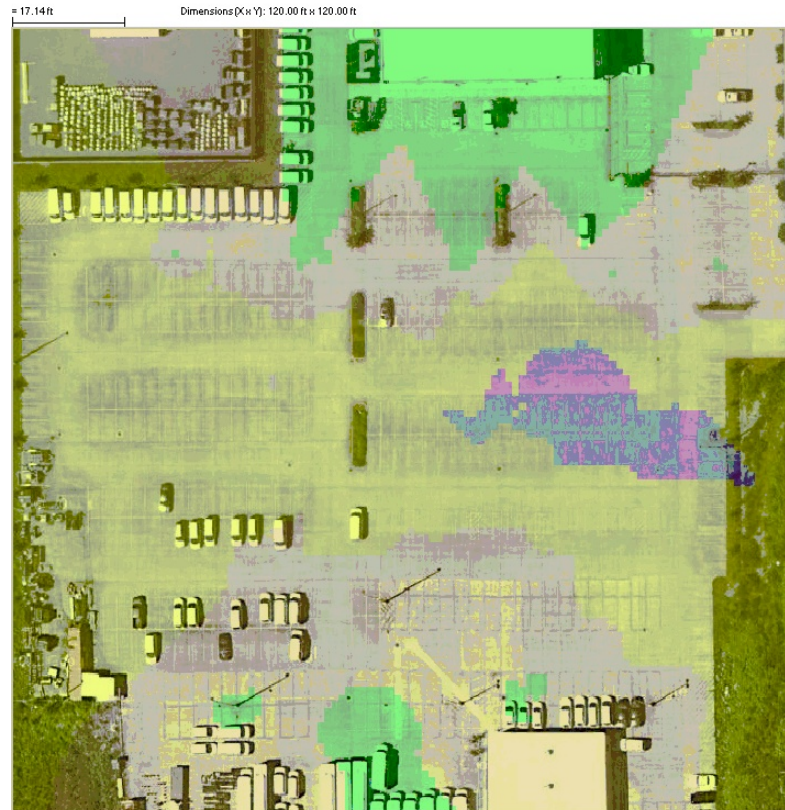
Comment [jb4]: CR-002624 PT
Install-Comm Base WDOLS



F.9

WAP 5 Maximum Speed Distribution

Comment [jb5]: CR-002624 PT
Install-Comm Base WDOLS



Appendix G KCM South Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM South Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 1/17/2008 3:45:03 PM

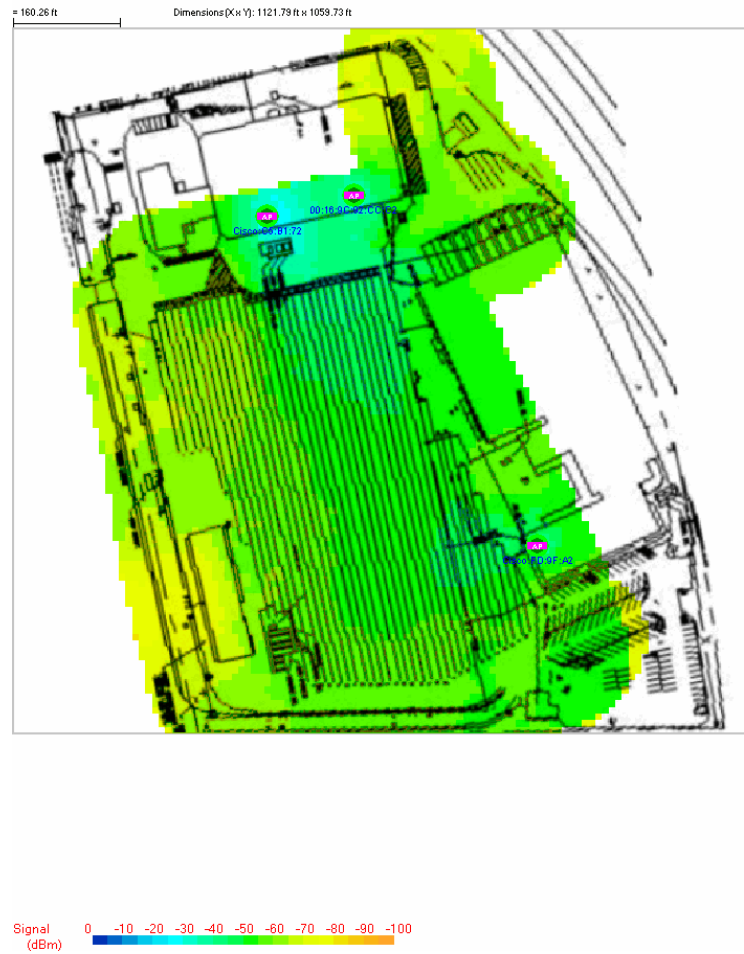
G.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
Cisco:C5:B1:72	802.11g	00:18:74:C5:B1:72	1	K9C8SC67BR42	100	-18
Cisco:FD:9F:A2	802.11g	00:15:C7:FD:9F:A2	6	K9C8SC67BR42	100	-31
00:16:9C:92:CC:C2	802.11g	00:16:9C:92:CC:C2	11	K9C8SC67BR42	100	-25

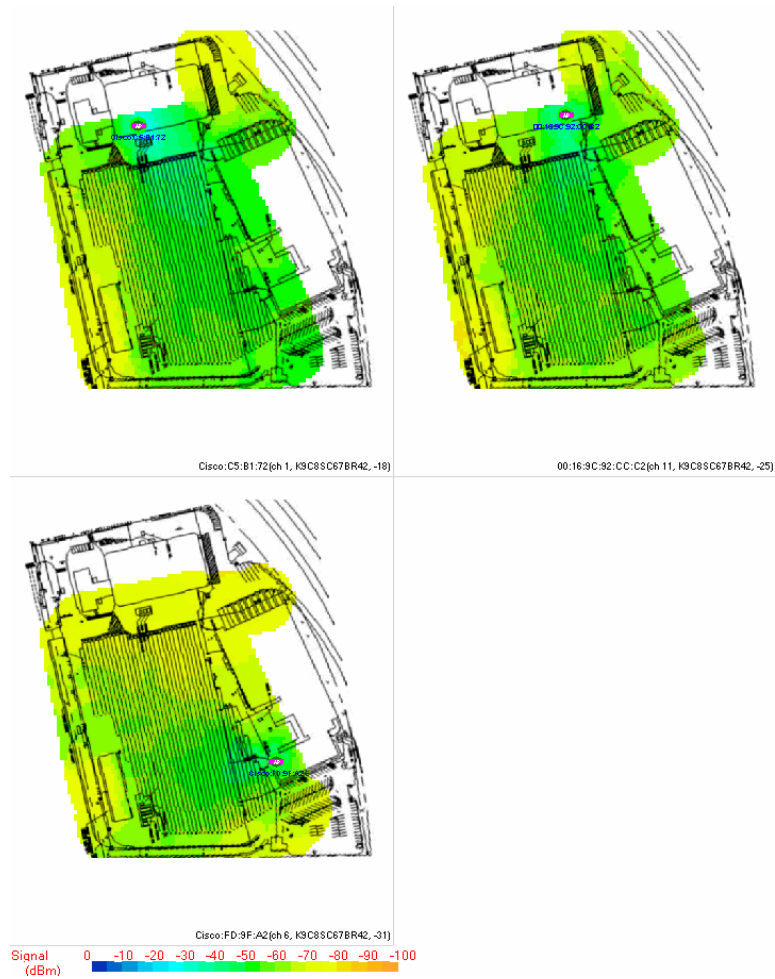
of AP 3

Total AP: 3

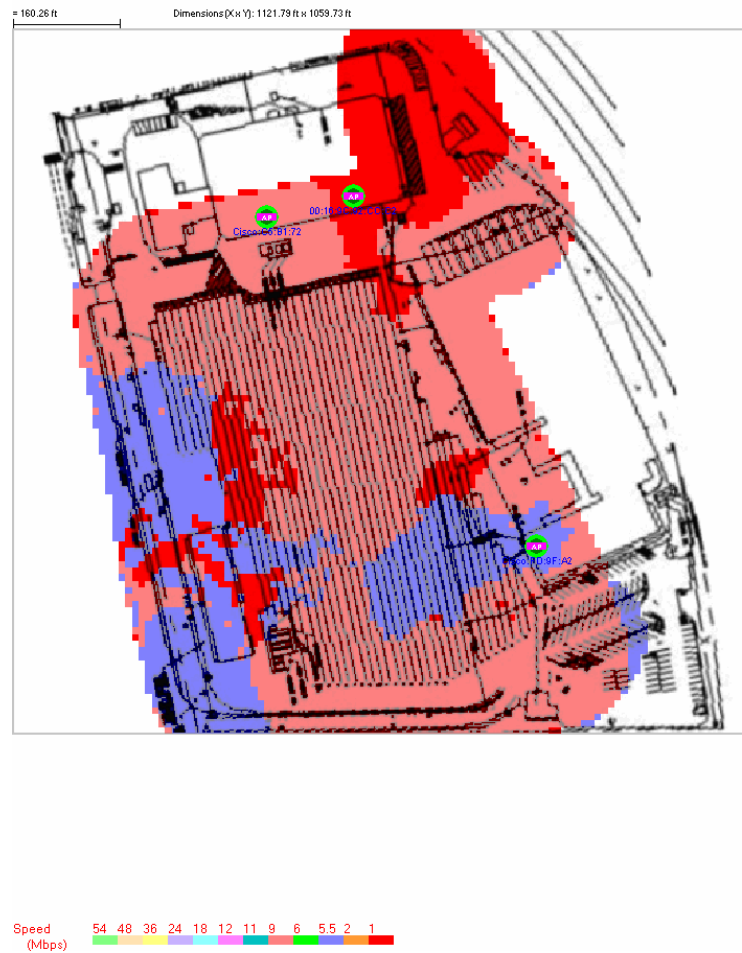
G.2 Signal Distribution



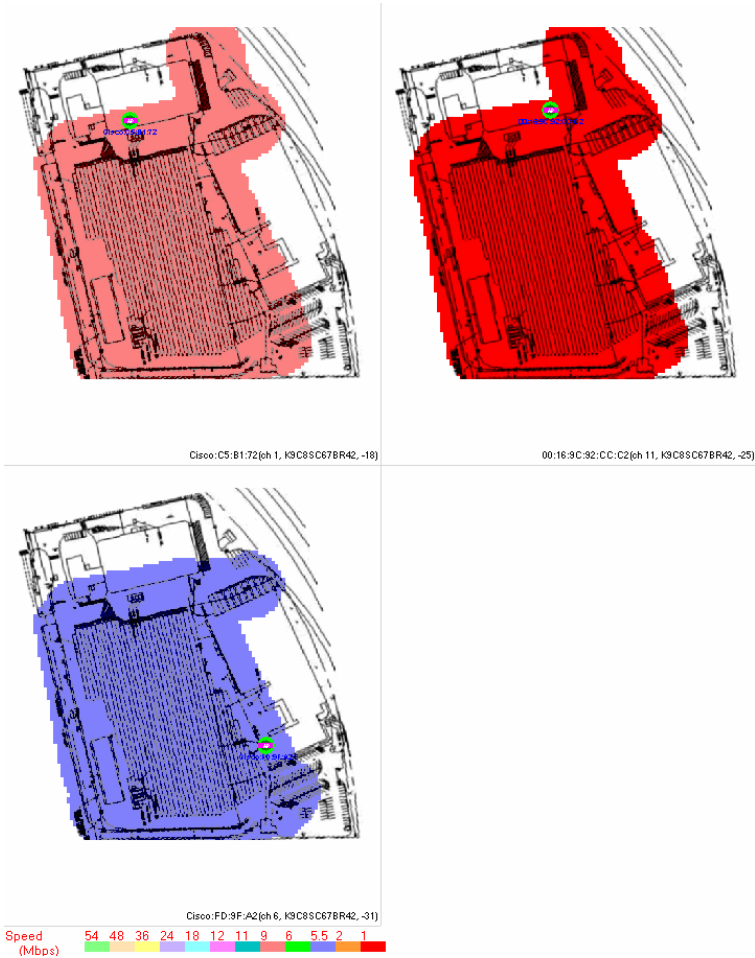
G.3 Individual Signal Distribution



G.4 Maximum Speed Distribution



G.5 Individual Speed Distribution



Appendix H KCM Central Atlantic Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM Central Atlantic Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 1/7/2008 3:19:54 PM

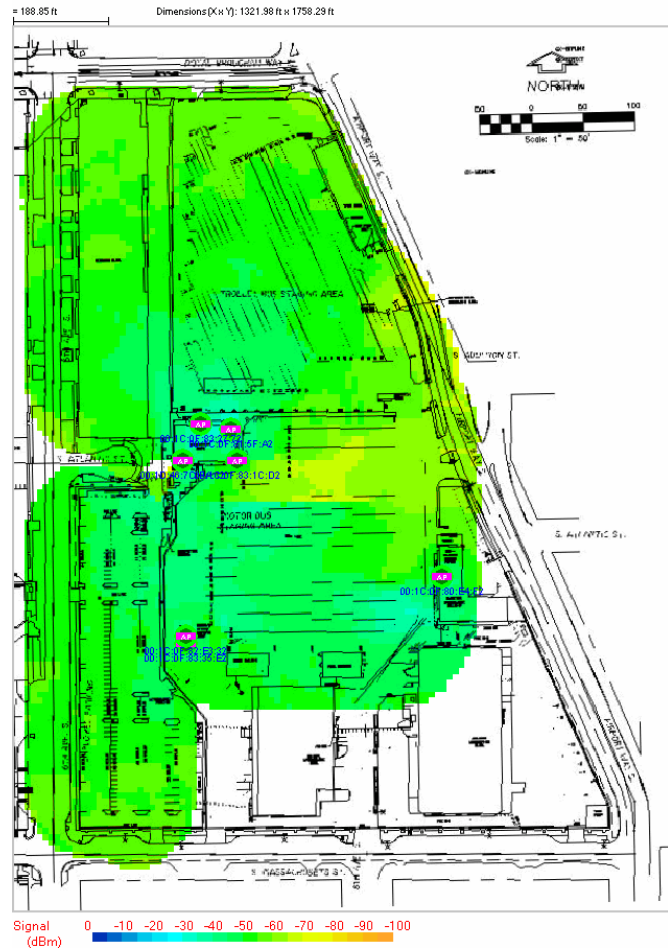
H.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:1D:46:7C:FA:32	802.11g	00:1D:46:7C:FA:32	4	K9C8SC67BR42	100	-30
00:1C:0F:82:E3:32	802.11g	00:1C:0F:82:E3:32	5	K9C8SC67BR42	100	-31
00:1C:0F:83:27:72	802.11g	00:1C:0F:83:27:72	5	K9C8SC67BR42	100	-25
00:1C:0F:83:1C:D2	802.11g	00:1C:0F:83:1C:D2	6	K9C8SC67BR42	100	-37
00:1C:0F:80:E4:F2	802.11g	00:1C:0F:80:E4:F2	7	K9C8SC67BR42	100	-33
00:1C:0F:83:35:E2	802.11g	00:1C:0F:83:35:E2	8	K9C8SC67BR42	100	-32
00:1C:0F:81:5F:A2	802.11g	00:1C:0F:81:5F:A2	10	K9C8SC67BR42	100	-30

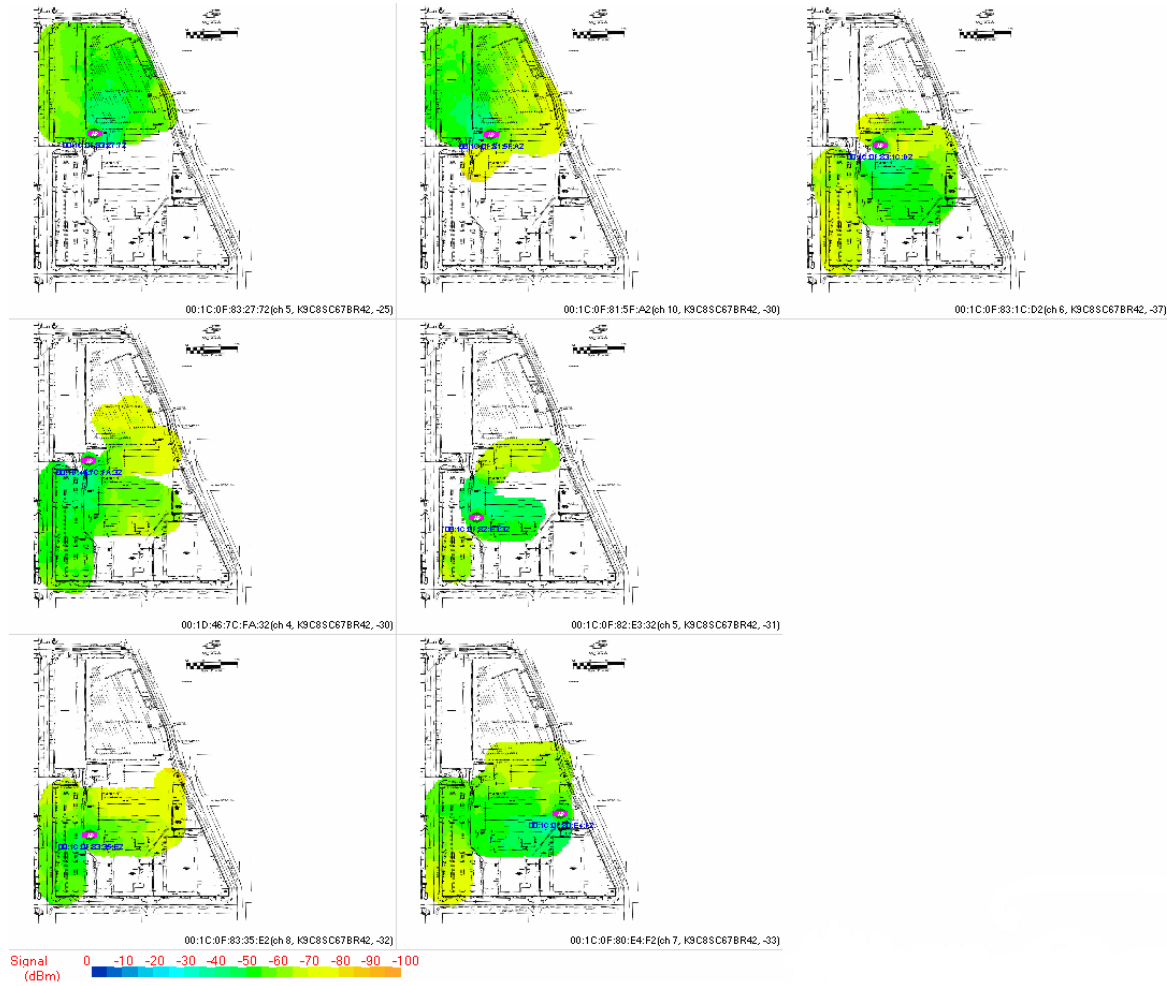
of AP 7

Total AP: 7

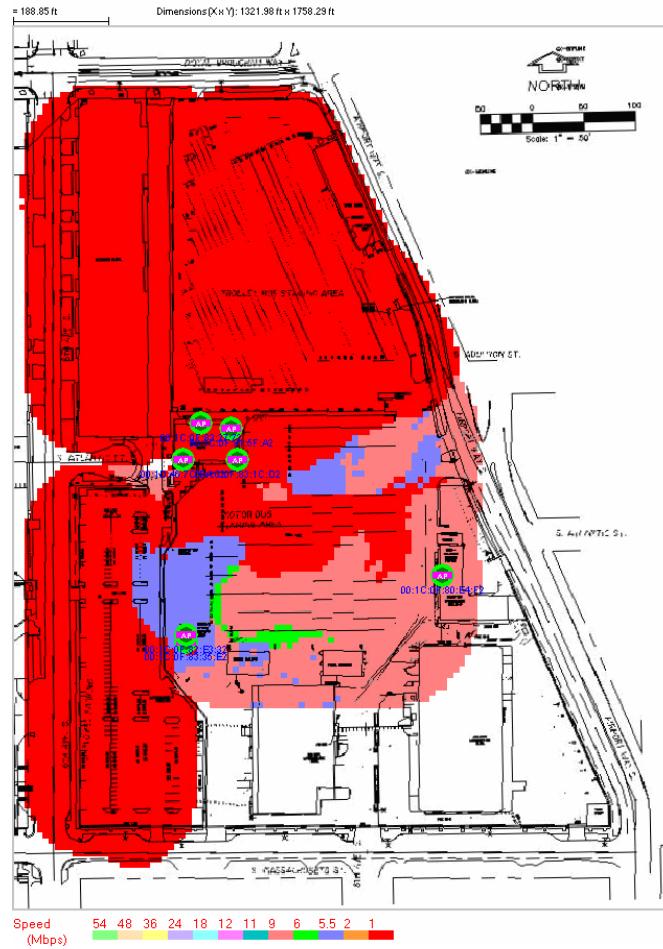
H.2 Signal Distribution



H.3 Individual Signal Distribution



H.4 Maximum Speed Distribution



H.5 Individual Speed Distribution



Appendix I KCM Ryerson Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM Central Atlantic Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 2/1/2008 11:18:00 AM

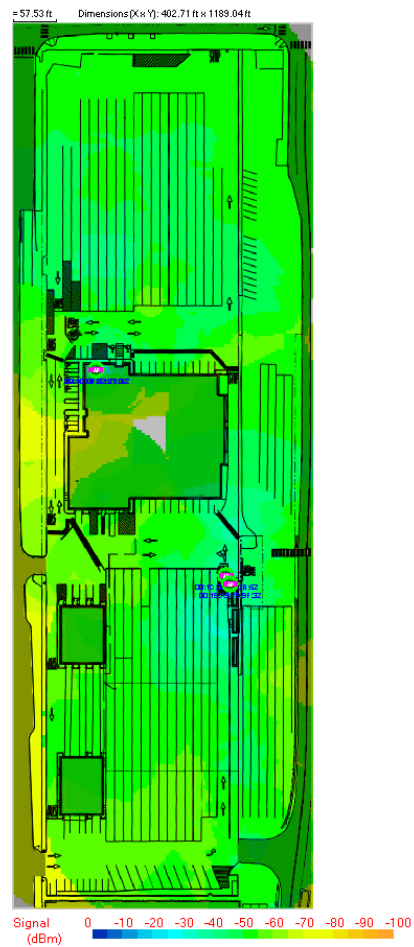
I.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:19:A9:79:9F:32	802.11g	00:19:A9:79:9F:32	1	K9C8SC67BR42	100	-25
00:1C:0F:82:DB:B2	802.11g	00:1C:0F:82:DB:B2	1	K9C8SC67BR42	100	-35
00:1C:0F:83:27:02	802.11g	00:1C:0F:83:27:02	6	K9C8SC67BR42	100	-27
00:1C:0F:83:3B:62	802.11g	00:1C:0F:83:3B:62	11	K9C8SC67BR42	100	-28

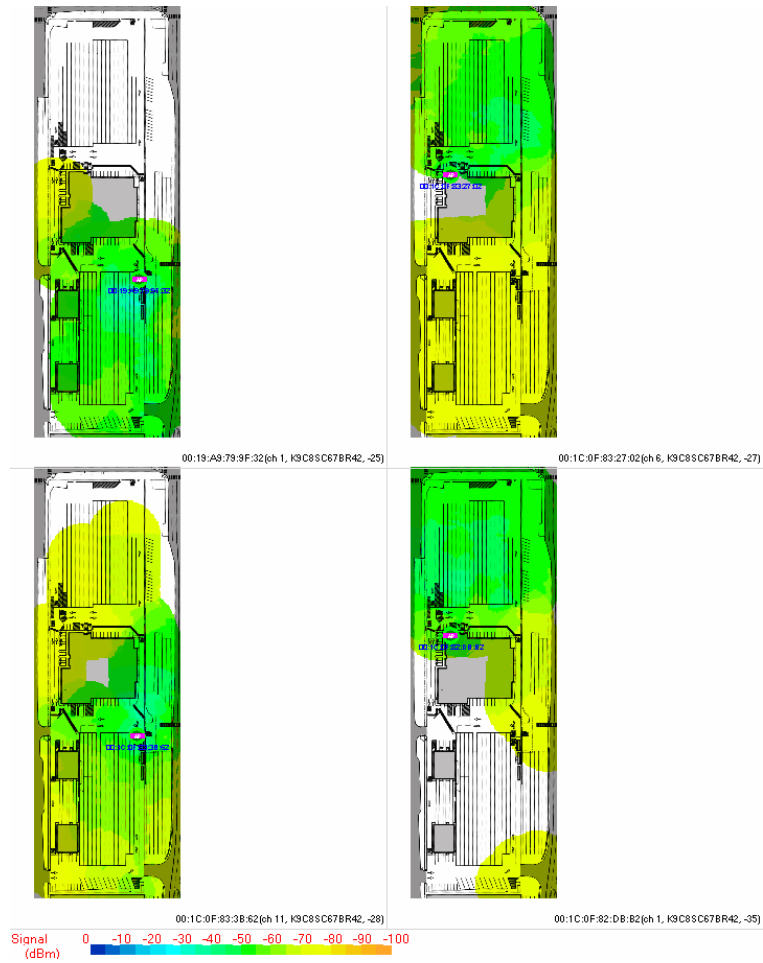
of AP 4

Total AP: 4

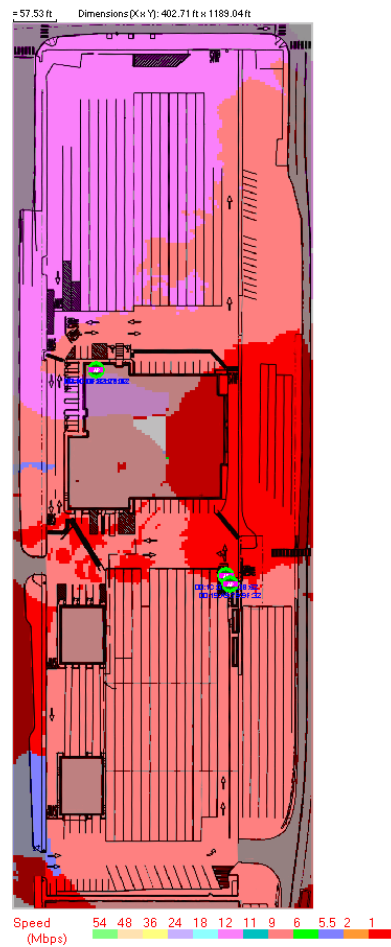
I.2 Signal Distribution



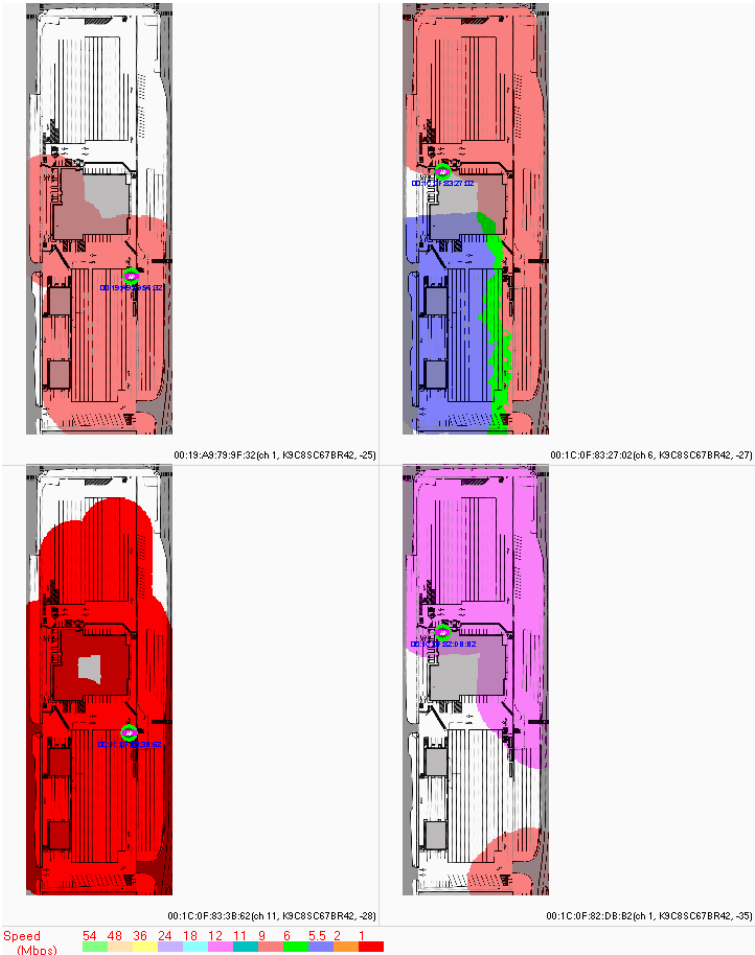
I.3 Individual Signal Distribution



I.4 Maximum Speed Distribution



I.5 Individual Speed Distribution



Appendix J KCM East Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM Central Atlantic Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 1/18/2008 10:56:39 AM

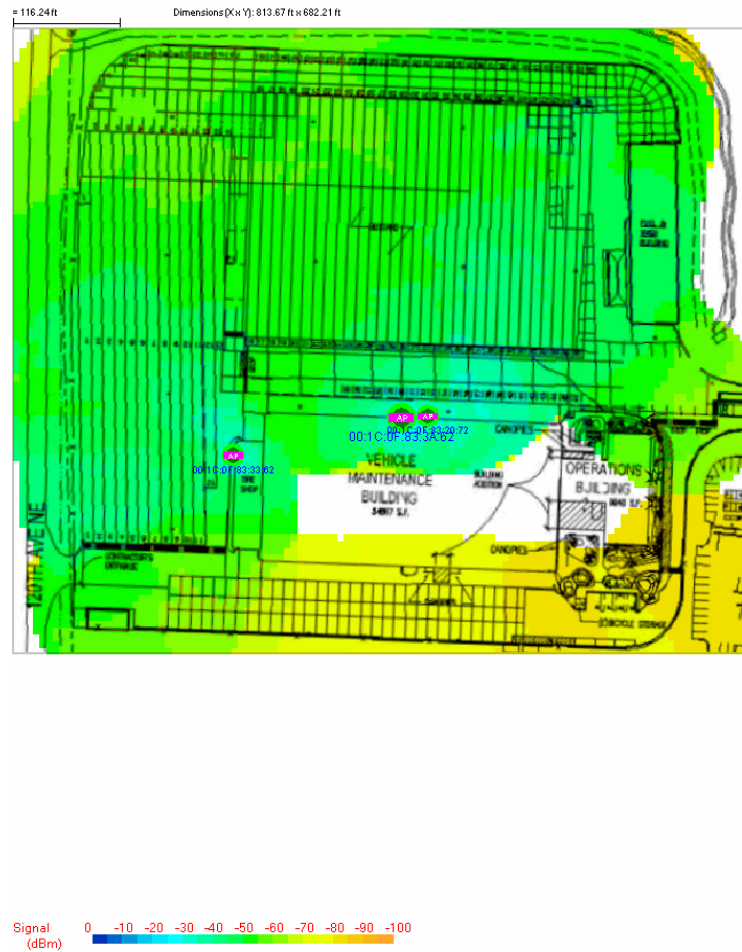
J.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:1C:0F:83:20:72	802.11g	00:1C:0F:83:20:72	1	K9C8SC67BR42	100	-26
00:1C:0F:80:E8:82	802.11g	00:1C:0F:80:E8:82	6	K9C8SC67BR42	100	-41
00:1C:0F:83:33:62	802.11g	00:1C:0F:83:33:62	11	K9C8SC67BR42	100	-25
00:1C:0F:83:3A:62	802.11g	00:1C:0F:83:3A:62	11	K9C8SC67BR42	100	-20

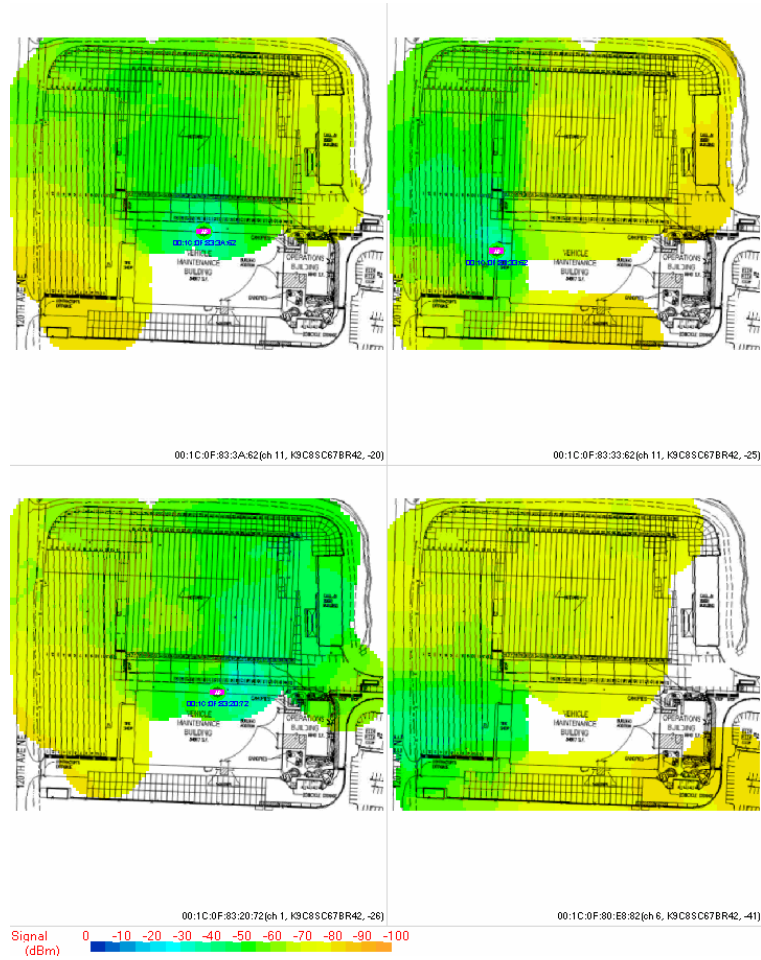
of AP 4

Total AP: 4

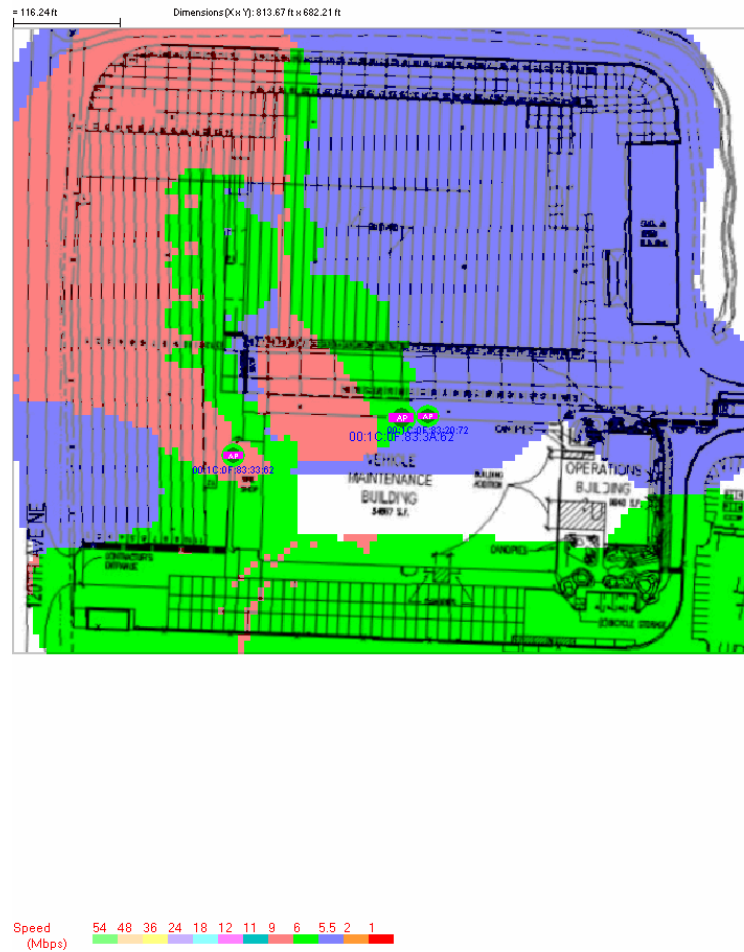
J.2 Signal Distribution



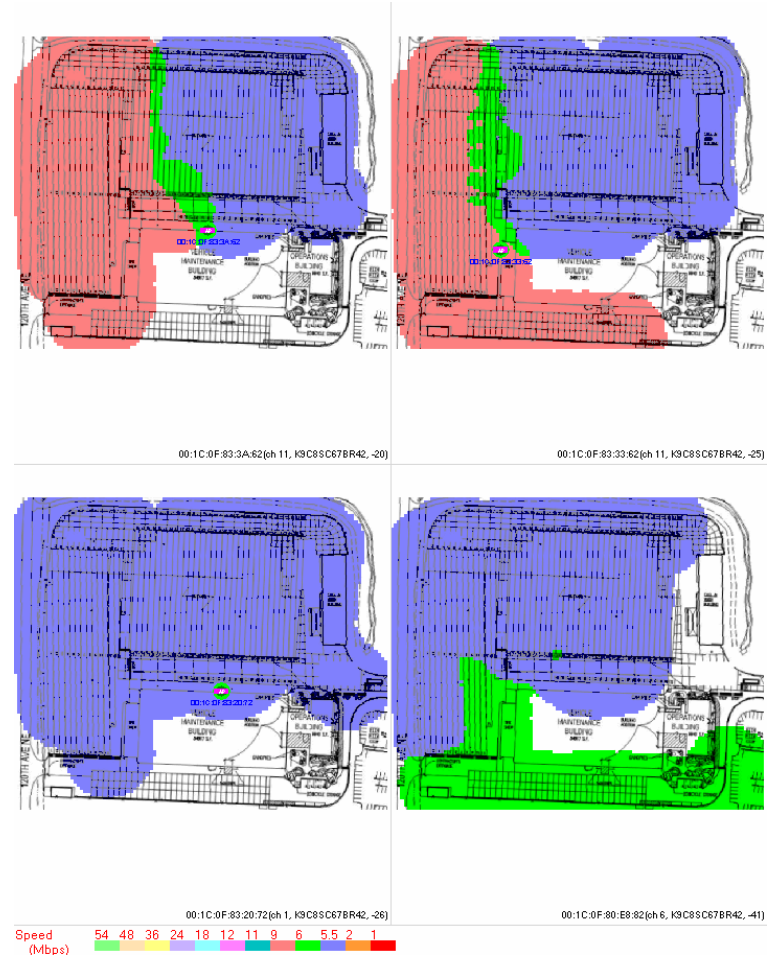
J.3 Individual Signal Distribution



J.4 Maximum Speed Distribution



J.5 Individual Speed Distribution



Appendix K KCM Bellevue Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM Central Atlantic Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 1/18/2008 1:36:03 PM

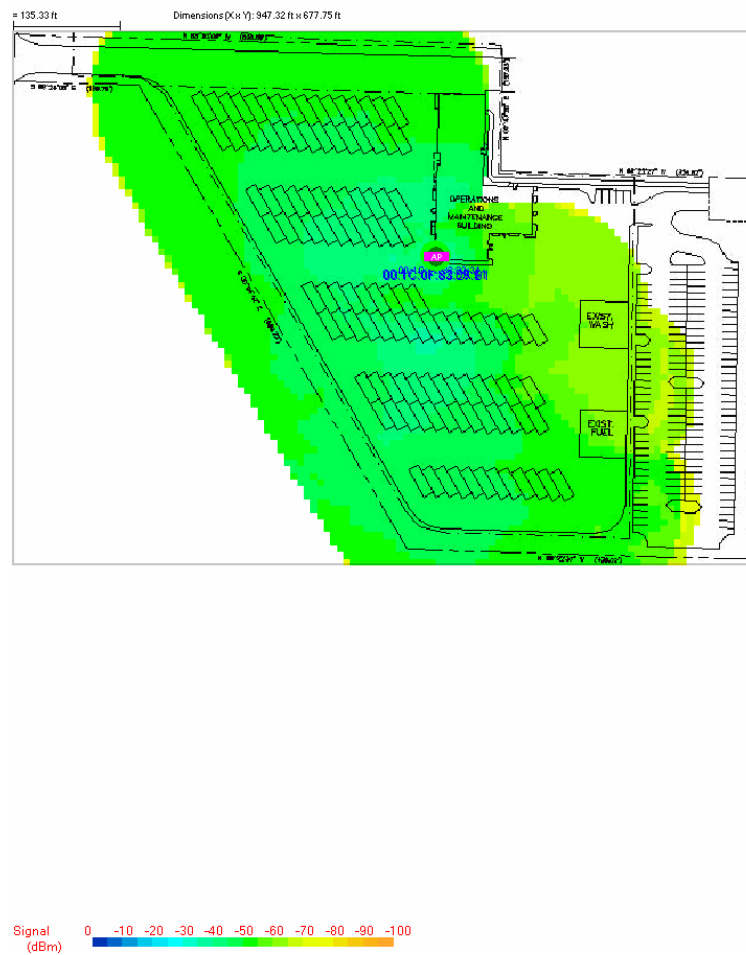
K.1 Access Points Information

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:1C:0F:83:32:31	802.11g	00:1C:0F:83:32:31	1	K9C8SC67BR42	100	-30
00:1C:0F:83:3A:51	802.11g	00:1C:0F:83:3A:51	6	K9C8SC67BR42	100	-38
00:1C:0F:82:F8:11	802.11g	00:1C:0F:82:F8:11	11	K9C8SC67BR42	100	-37
00:1C:0F:83:27:B1	802.11g	00:1C:0F:83:27:B1	11	K9C8SC67BR42	100	-34

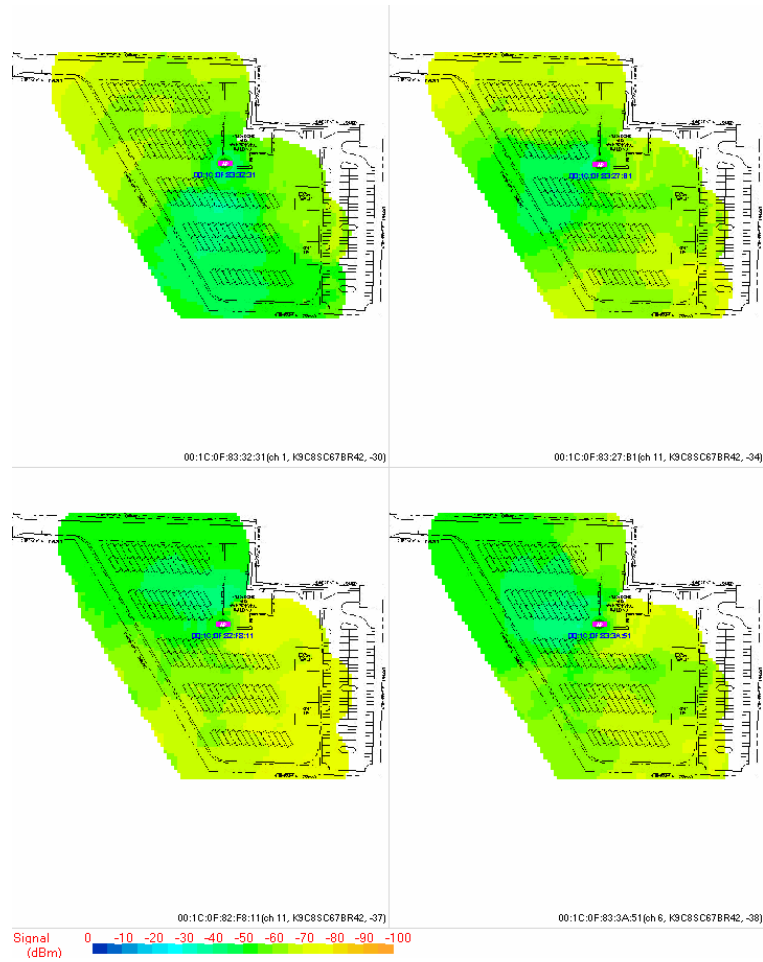
of AP 4

Total AP: 4

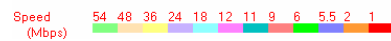
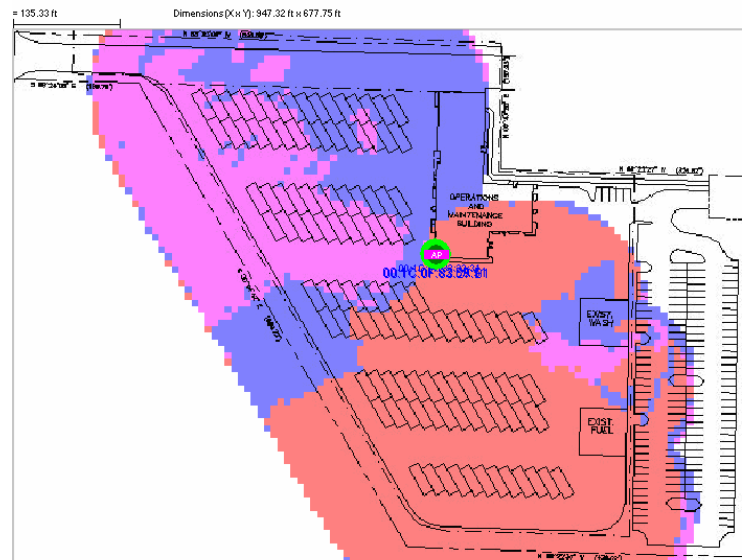
K.2 Signal Distribution



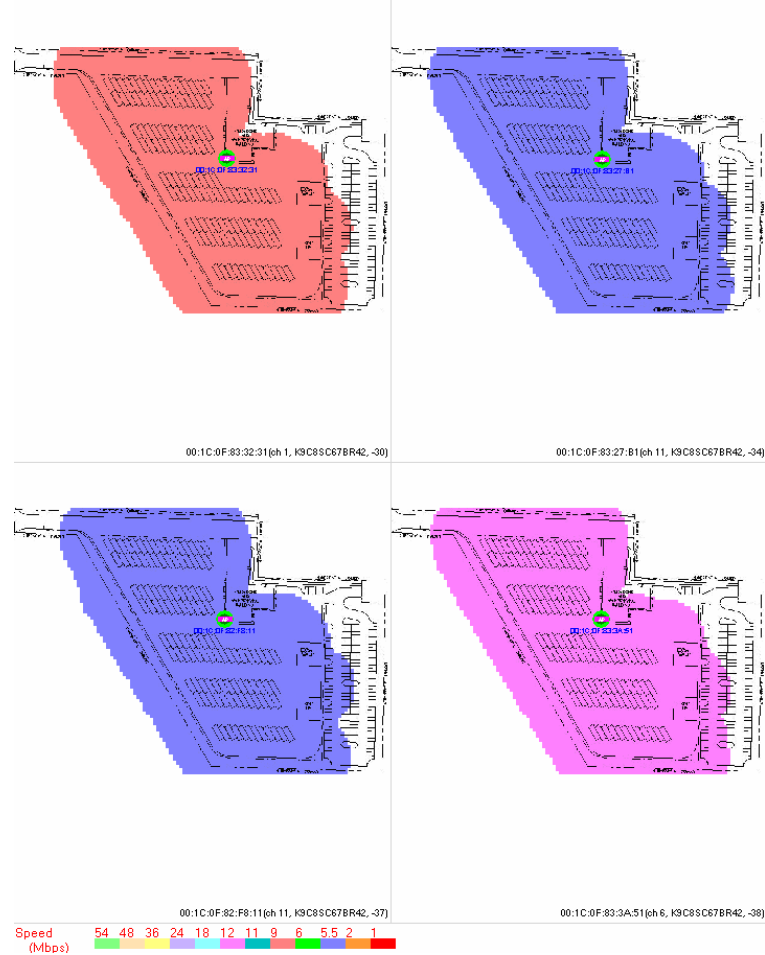
K.3 Individual Signal Distribution



K.4 Maximum Speed Distribution



K.5 Individual Speed Distribution



Appendix L KCM North Base Wireless Site Survey Report

Surveyor: Chris Jefferies

Location: KCM Central Atlantic Base

Survey Description: Determine signal strength and coverage provided by Access Points.

Time of Survey: 1/23/2008 2:45:15 PM

L.1 Access Points Information

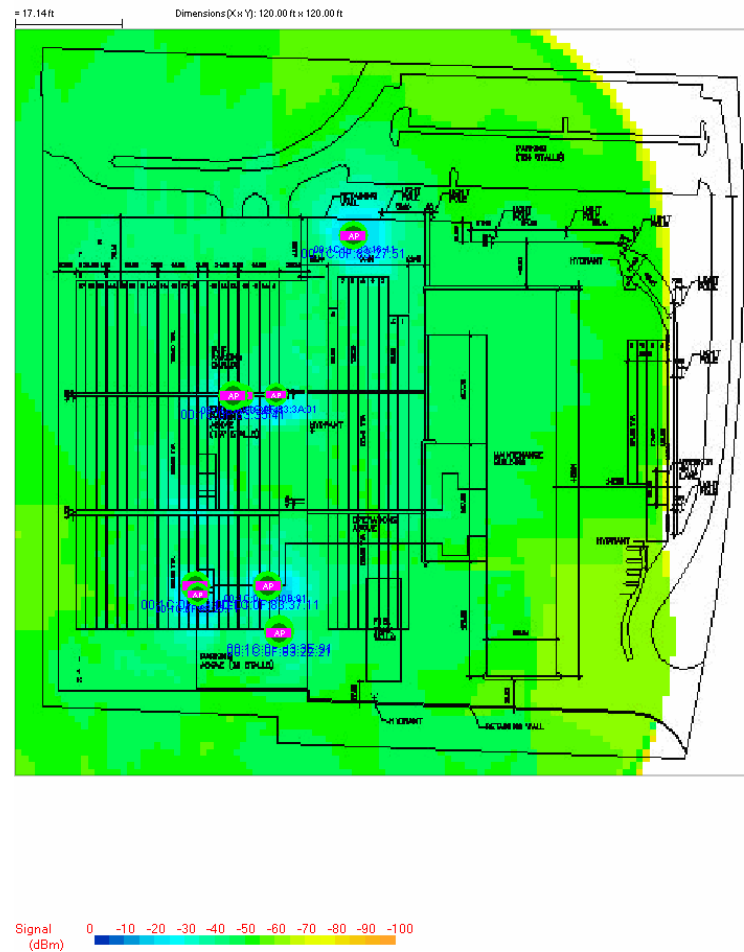
AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:1C:0F:83:0B:91	802.11g	00:1C:0F:83:0B:91	1	K9C8SC67BR42	100	-22
00:1C:0F:83:37:11	802.11g	00:1C:0F:83:37:11	1	K9C8SC67BR42	100	-20
00:1C:0F:83:3A:01	802.11g	00:1C:0F:83:3A:01	1	K9C8SC67BR42	100	-21
00:1C:0F:83:3E:41	802.11g	00:1C:0F:83:3E:41	1	K9C8SC67BR42	100	-28
00:1C:0F:83:3E:91	802.11g	00:1C:0F:83:3E:91	2	K9C8SC67BR42	100	-34
00:1C:0F:83:16:11	802.11g	00:1C:0F:83:16:11	4	K9C8SC67BR42	100	-22
00:1C:0F:83:25:F1	802.11g	00:1C:0F:83:25:F1	7	K9C8SC67BR42	100	-22
00:1C:0F:83:27:51	802.11g	00:1C:0F:83:27:51	7	K9C8SC67BR42	100	-20
00:1C:0F:83:22:21	802.11g	00:1C:0F:83:22:21	9	K9C8SC67BR42	100	-60
00:1C:0F:83:35:41	802.11g	00:1C:0F:83:35:41	9	K9C8SC67BR42	100	-24

AP Name	Media Type	Mac Address	Channel	SSID	Power (mW)	Max Signal
00:1C:0F:83:1D:D1	802.11g	00:1C:0F:83:1D:D1	11	K9C8SC67BR42	100	-20

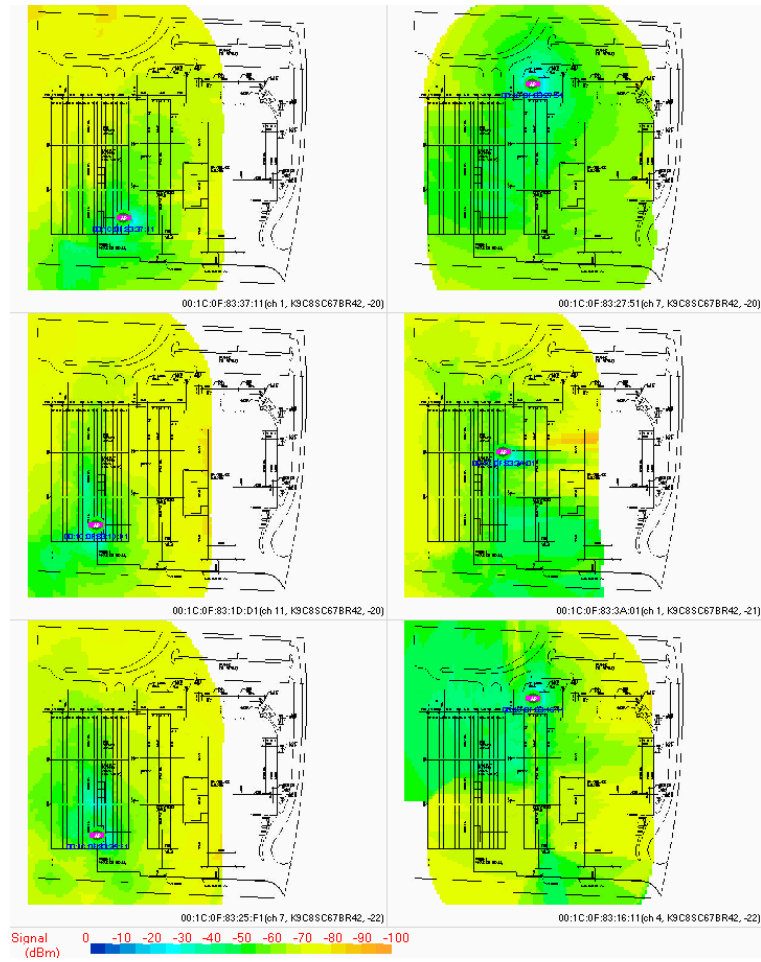
of AP 11

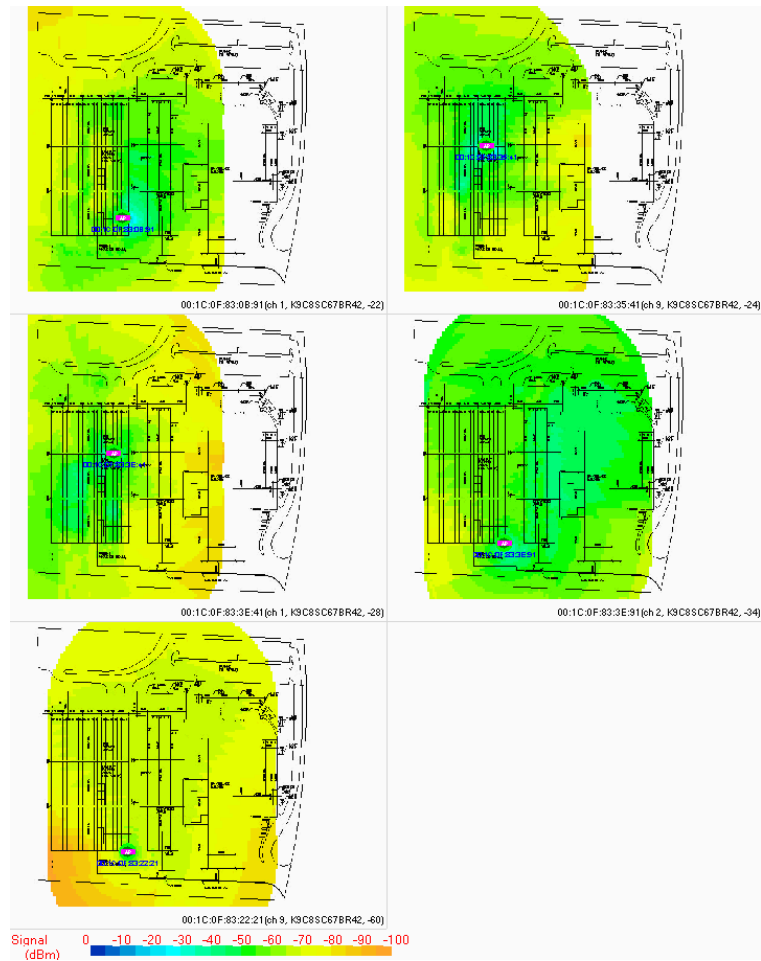
Total AP: 11

L.2 Signal Distribution

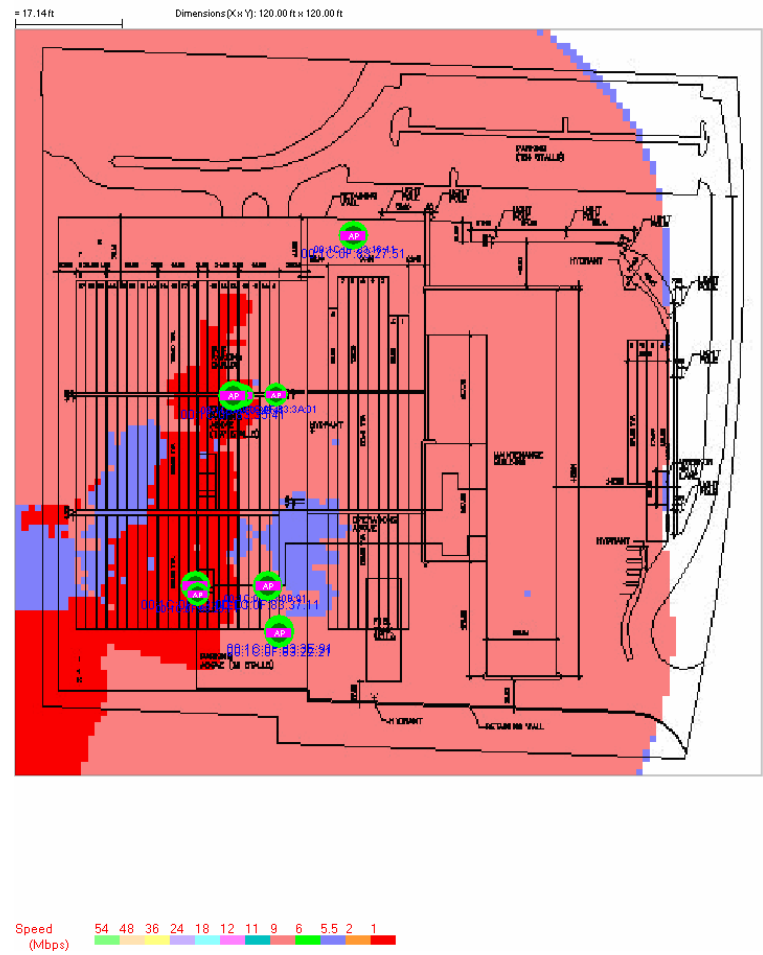


L.3 Individual Signal Distribution





L.4 Maximum Speed Distribution



L.5 Individual Speed Distribution

